THE PAPER INDUSTRY and PAPER WORLD

VOLUME 22
NUMBER 3
JUNE, 1940

— FEATURES —

Mill in Mexico "Higher Up" Than Any Other Paper Mill ..... *O.K. Graef* 243
Simplified Curl Tester for Paper ..... *F. T. Carson and Vernon Worthington* 246
Paraffin Waxes . . . their Application to Papermaking ..... *W. K. Griesinger and M. H. Reynolds* 248
Specific Gravity—Temperature Relationships for Rosin Size Milk ..... *H. N. Bogart and D. S. Davis* 251
Chemical and Physico-Chemical Relationships of Pulps ..... *S. I. Aronovsky and E. C. Dryden* 253
Convention Papers . . . Abridged 278

— NEWS —

Trade Winds 217
Associations 258
Allied 264
Safety 270
Other Countries ..... .
Names in the News 272
Personals 272
Necrology 276

— DEPARTMENTS —

Theme Page 216
Coming Events 228
Editorials 235
Current Thought 236
Paper Sketches 257
Safety Contest Scores 270
New Equipment and Supplies 298
Technical Developments 302
Papermaking Patents 304
New Publications 306
Current Market Quotations 308
Index to Advertisers 311

PUBLISHER
FRITZ PUBLICATIONS, Inc.

Founded by
EDWARD B. FRITZ

A. SCOTT DOWD,
President & Gen. Mgr.

A. C. L. FRITZ,
Vice Pres. & Treas.

A. C. BRUCE, Secretary

HARRY E. WESTON,
Editorial Director

BESSE MERRITHEW, Editor

A. L. EKLUND,
Circulation Manager

EDGAR C. FARREN,
Production Manager

Published monthly, on the tenth of the month, by Fritz Publications, Inc., 59 E. Van Buren St., Chicago, Ill. Eastern Representative: L. D. Schnabel, 9 Rockefeller Plaza, New York, N. Y. Pacific Coast Representative: Norman C. Nourse, 1031 S. Broadway, Los Angeles, Calif. THE PAPER INDUSTRY and PAPER WORLD is a member of the Audit Bureau of Circulations and The Associated Business Papers, Inc. Entered as second class matter June 29, 1938, at the post office at Chicago, Ill., under the Act of March 3, 1879. Subscriptions in the United States, U. S. Possessions, Canada, Cuba and Mexico, $2.00 for one year, or $3.00 for two years. All other countries, $3.00 for one year, or $5.00 for two years. Copyrighted 1940 by Fritz Publications, Inc.

THE PAPER INDUSTRY and PAPER WORLD is indexed regularly in *The Industrial Arts Index*.
An index to each volume is issued annually by the Publisher as Section Two of the April number.

Triplets . . .

. . . and full of "the dickens".

Corrosion, oxidation and pressure—if you're having trouble with these triplets you'll thank us for telling you about TIMKEN DM tubes (they're designed for creep and pressure resistance) and TIMKEN Sicromo tubes (they're designed for resistance to oxidation and corrosion.)

Both DM and Sicromo tubes are intermediate in cost.

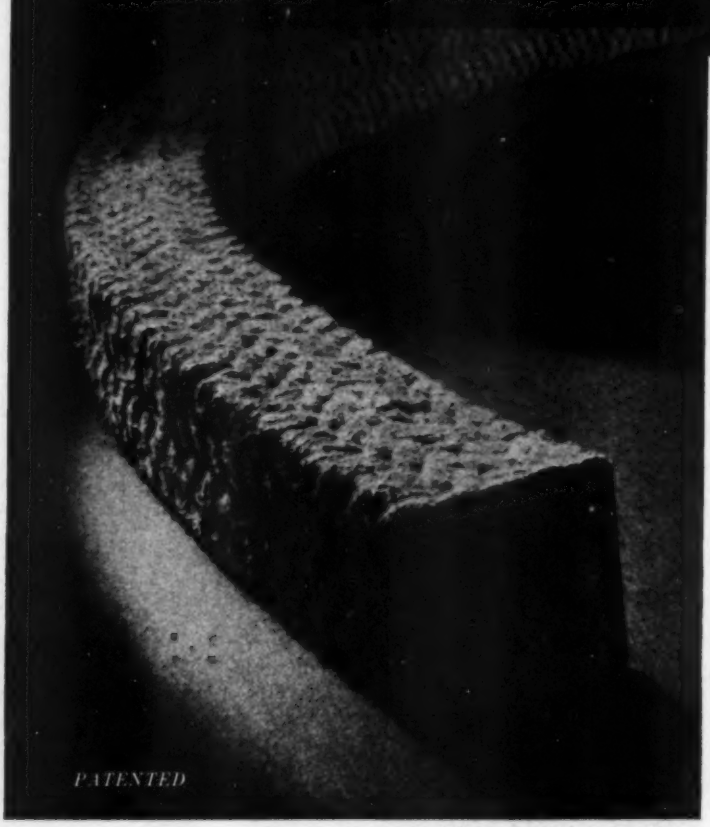
May we give you more detailed data on the performance of these money-savers?

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

TIMKEN
SEAMLESS STEEL TUBES

Garlock Announces

LATTICE-BRAID



An Entirely New Braided Packing Construction

GARLOCK Patented LATTICE-BRAID Packings are braided *through and through*—in an entirely new and different way from ordinary braided packings.

All braided strands are lattice-linked into a structural unit, resulting in greater strength, longer life, semi-automatic action and unusual flexibility.

Special new machines enable us to make LATTICE-BRAID in a distinctive pattern which is *infinitely better* and *positively proven.*

GARLOCK LATTICE-BRAID Packing is available in the following styles: GARLOCK 730 for centrifugal and rotary pumps handling hot or cold water, caustic solutions or weak acids. GARLOCK 731 for rods operating against steam, gas, acids, lye and caustic soda solutions. GARLOCK 732 for heavy duty service against high pressure steam or hot oil. GARLOCK 736 for centrifugal or rotary pumps handling acids or strong chemical solutions. GARLOCK 751 for centrifugal or rotary pumps handling cold oil or water.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

Mail this coupon for descriptive folder!

The Garlock Packing Company
Palmyra, New York

Please send descriptive folder on Garlock Lattice-Braid Packings.

NAME.....

COMPANY.....

ADDRESS.....

.....

GARLOCK

P.I. 6-40

"Freedom may come quickly in robes of peace, or after ages of conflict and war; but come it will, and abide it will, so long as the principles by which it was acquired are held sacred."
—Edward Everett

Typical of the peace and contentment of our nation is the paper mill illustrated above with its community of happy homes. . . . Such peaceful, happy communities where dwell the families of the men who make the industrial wheels of this country go 'round are truly the pulse of the nation. . . . Then let us know that "so long as the principles by which it was acquired are held sacred," this country will continue to enjoy its freedom and truly will be "the land of the free and the home of the brave."

"Lest We Forget"

NEPCO REBUILDS NO. 7 PAPER MACHINE IN PORT EDWARDS MILL

▶▶▶ THE FIRST PAPER was put over the new conditioned and rebuilt No. 7 paper machine of the Nekoosa-Edwards Paper Company in their Port Edwards, Wisconsin, mill on May 7. A day and a half over a calendar month had elapsed since old No. 7 was brought to a stop, and the waiting crew of millwrights, pipefitters, electricians, and laborers had started the task of a complete rebuilding of the machine with the exception of the fourdinier section, calender stacks, and reel.

Three Bird screens were placed at the end of the head box and the head box itself was completely rebuilt, incorporating the latest ideas of baffled stock flow from the screens through the slice.

The fourdrinier section was thoroughly cleaned and repainted. The old dryer section was completely replaced with carefully reconditioned dryers. The reconditioning included resurfacing and balancing of each dryer, and the frame for the dryer section was thoroughly cleaned and repainted, and the bearing completely overhauled. The new dryer section has as an integral part, a complete rope carrier system that carries the paper over the machine from the third press to the calender stack. Six additional dryers were also added, necessitating the relocation of the breaker stack, the finishing calender stack, and the winder.

The winder was equipped with a variable speed V-belt drive arrangement that provides for driving the winder drums at different speeds, thus giving control over the type of rolls wound and determining the "tightness" or "looseness" of the winding of the rolls.

General features involved in the whole project include a complete new hood for the machine, five new hypoid drives for the various sections of the machine, and a complete overhauling of the line shaft that drives the various sections of the machine. The steam engine was also given a complete overhauling during the shutdown.

An entirely new and larger mail steam line was built from the boiler room to the machine to provide larger amounts of steam necessary for the increased production.

The revamped refining system for new No. 7 is a radical departure from the old setup. The most important unit of this new scheme is the Jones Bertram beater that has been installed on the main floor at the wet end of the machine.

A reconditioned and rebuilt breaker beater in the basement reduces all pulps to slush condition. This beater drops directly through a large capacity pipe into a vertical-type Worthington pump that pumps the stock to the Bertram beater on the floor above. This transfer of stock from the breaker beater to the Jones Bertram is one of spectacular interest, as approximately a ton of pulp is transferred from the basement to the main floor in about three minutes at a consistency of 6 per cent.

The Jones Bertram beater is of the very latest type, both as regards to construction material and control. The beater is provided with three bed plates instead of the conventional single plate, thus giving greatly increased beating capacity. Indicative of the massive features of this equipment is the fact that the roll and shaft, without the driving pulley, weighs in the neighborhood of 18 tons.

The controls that operate the raising and lowering of the rolls are operated by compressed air. The position of the rolls with respect to the bed plate is designated on the recording instruments as the percentage of the total weight of the roll that is "down" at any one time. The automatic control is by means of a feeler arm that follows a cam cut to provide the correct beating cycle for any given grade of

Left—No. 7 paper machine at the Port Edwards (Wis.) mill of Nekoosa-Edwards Paper Company. This machine has just been completely rebuilt. Right—New, tile-lined Jones Bertram beater recently put into operation on the rebuilt No. 7 machine at the Nepco Port Edwards plant.

paper. The beater tub is completely lined with glazed tile.

To finish the stock refining, a reconditioned Appleton jordan is used between the machine chest and the paper machine. This arrangement of the jordan gives flexibility and the opportunity for quick changes in stock characteristics on the paper machine.

One of the main objects of the rebuilding was to provide increased capacity for No. 7, and also to improve the quality of the grades of paper. The new refining equipment has given gratifying improvements in the strength characteristics and also resulted in greater cleanliness both because of the details of construction of the system and through the greater ability of the new beater to brush out shives and fiber bundles.

The cleanliness of the paper has also been increased through the large amount of copper tubing that was installed as an incidental to a number of the major changes, and the increased drying capacity of the machine has contributed to an improved finish on the paper produced.

◆

PORT ALBERNI MILL PLANS PROGRESSING

Negotiations between the Port Alberni (British Columbia) council and representatives of a large timber company regarding water rights and other concessions relative to the construction of a pulp mill at that port are said to be in the final stage, according to a Vancouver report. The company, it was said, plans to spend $2,750,000 on a sulphite pulp mill having an initial capacity of 135 tons. At present the company conducts large scale logging operations on Vancouver Island and also operates two sawmills, one at Port Alberni and the other at Great Central (Cf. P. I. AND P. W., May, 1940, p. 122).

◆

C-W TO INSTALL PRECIPITATOR

Plans for the installation of a precipitator at the kraft mill of the Crown Willamette Paper Company division of Crown Zellerbach Corporation, Camas, Washington, has been announced by Resident Manager J. E. Hanny.

A Cottrell precipitator, guaranteed to eliminate a major portion of the ash from exit gases, has been ordered from the Western Precipitation Company of Los Angeles. To house the equipment, which will be ready for operation about August 1, a metal structure 26x37½ feet by 51 ft. in height will be built.

The quotation given on page 216 of this issue takes on an even deeper meaning when one recalls that the author, Edward Everett, was a celebrated American orator and statesman, 1794-1865. He was a brother of A. H. Everett, diplomat and political writer. . . . The illustration on the same page is reproduced from an aerial photograph of the plant and surrounding community of The Mead Corporation, Chillicothe, Ohio.

The precipitator consists of a shell, super-structure, substation, dampers, electrode system and electrode rapping device. All flue gases from the recovery unit will be routed through the precipitator. Passing over a screen charged with 60,000 volts of electricity, the solid particles from the gases will be attracted to collecting tubes. At definite, pre-determined intervals, these tubes will be automatically rapped, shaking the recovered solids loose in flake form to be collected in hoppers and conveyed back to the recovery process.

Meanwhile, gases going out of the mill stack will be practically free of ash and there will be a tendency to reduce disagreeable odors characteristic of kraft mill gases.

Other experiments are being carried on throughout the plant to explore further methods of reducing odorous gases.

◆

INSTITUTE TO STUDY SULPHUR

A long-range program of research has been inaugurated at the Institute of Paper Chemistry, Appleton, Wisconsin, by the Texas Gulf Sulphur Company, Inc., 75 East 45th Street, New York City. The initial investigation will be devoted to the study of the function of sulphur and its compounds in the production of sulphate pulp as well as the possible use of sulphur in combination with paper products. The scope of the research is intentionally broad and it is hoped that the information obtained will be of benefit to the pulp and paper industry.

The program is planned to make available to the pulp and paper industry more information regarding sulphur. Specifically, one objective is the study of the sulphate process which is being used to an increasing extent in converting the soft woods of the South into wood pulp. This sulphate process, as well as the sulphite process, requires a sulphur compound as one of the active pulping agents.

It is hoped the present research will help to determine how these sulphur compounds can be most efficiently applied. The second immediate objective of the research is to determine whether sulphur can be combined with certain waste products in the production of articles of commercial utility, or whether sulphur can be used to impart novel properties to pulp and paper and thus increase their field of usefulness. Arrangements have been made to publish the results of this investigation from time to time and thus make them available to the entire industry.

This is the second research project undertaken by the Institute for the Texas Gulf Sulphur Company. The first, in collaboration with Texas Gulf engineers, resulted in the perfection of the Tegul sulphur burner in which molten sulphur is sprayed and burned and which operates somewhat like the common oil burner.

◆

MEAD SELLS INTEREST IN ST. JOE CO.

The Mead Corporation has sold its interest in the St. Joe Paper Company, Port St. Joe, Florida, stockholders were informed recently. The Mead Corporation, which had owned fifty per cent of the company, relinquished the ownership to Gulf Coast Properties, Inc., which had, prior to this sale, owned fifty per cent of the Florida paper company.

No price was named but it was stated that the Mead Corporation received a cash amount which would cover the investment plus profit. The Mead Corporation's investment in the St. Joe Paper Company was carried at $1,850,000. Mr. George H. Mead announced that it was the opinion of the management that the funds received from the sale of the St. Joe equity could be used to better advantage in other branches of the company's business.

◆

HEARINGS ON WAGE AND HOUR RECOMMENDATION

Two days were devoted at Washington, D. C., May 20 and 21, to the hearings on the proposed 40-cent per hour minimum wage recommendation of the Wage and Hour Committee named to investigate the application of the federal law as to minimum wages. Extensive testimony was taken, particularly to show that the proposed base would tend to force the shutting down of certain mills which are now, because of special conditions, paying less than the proposed minimum. Those who appeared at the hearings will be permitted to make oral arguments on the record or file briefs on June 12.

"But I didn't call a taxi!"

...SAID THE DIVING GIRL ON PAGE 21 TO THE CAB-DRIVER ON PAGE 22

"It ain't *my* fault, lady," sighed the cab-driver. "Blame it on the guy who makes the paper. I'm *show-through* from the next page."

"Oh, dear!" wailed the girl. "How can I practise my dives with your taxi in the way?"

"You could if you'd speak to the paper-maker."

"About Krebs Pigments?"

"Sure, lady," said the cabbie. "He ought to know about these pigments. They make the thinnest paper opaque."

"You're pretty bright, mister," said the girl, brightening up herself.

"Not half as bright as Krebs Pigments," replied the cabbie. "You should see how clean and white they make the paper . . . how sharp and clear the printing stands out on both sides. And they're as easy to use as falling off a diving board . . . "

"My goodness!" said the girl. "Will Krebs help my diving, too?"

"Not exactly . . . but the Krebs people will give all the technical information your paper manufacturer needs."

"You've earned a fare, cabbie," said the girl. "Quick! Drive me to Krebs."

"You don't need a taxi, lady," smiled the cabbie. "Just send 'em a letter!"

KREBS PIGMENT & COLOR CORP.
1007 Orange Street...Wilmington, Delaware

MILL OFFICIALS MAKE TOUR OF INSTITUTE AT APPLETON

▶▶▶ IN CELEBRATION OF its tenth anniversary, the Institute of Paper Chemistry, Appleton, Wisconsin, was host May 16-17 to its Fifth Annual Executives Conference, demonstrating its activities and entertaining officers, executives and owners of paper mills and related industries throughout the country.

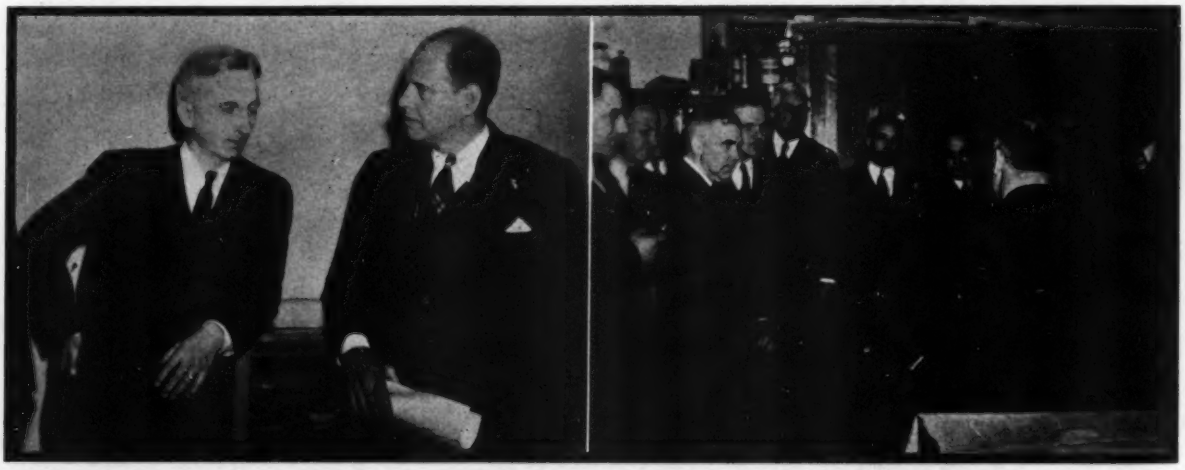
The Conference began with a meeting of the Board of Trustees, presided over by Ernst Mahler, executive vice president of the Kimberly-Clark Corporation and chairman of the Institute's board, after which there were inspection tours, discussions, talks and entertainment.

Mill members registered on Thursday, May 16, after which they toured the entire Institute witnessing all of its operations including students working at various academic assignments. Candidates for master's and doctor's degrees stood by to discuss the technical aspects of their work.

At the noon luncheon, which was presided over by D. C. Everest, president of Marathon Paper Mills, Rothschild, Wisconsin, Dr. Westbrook Steele presented a comprehensive anniversary review of the Institute and J. M. Conway, president of Hoberg Paper Mills, told the group of the program of Wisconsin mills in the study of stream pollution problems. During the afternoon the members attempted to play golf and skeet shoot but bad weather hampered this schedule. A banquet, which was attended by 130 persons, was held that evening at the North Shore Golf Club on Lake Winnebago at which time a program was presented by the Lawrence College A Cappella Choir.

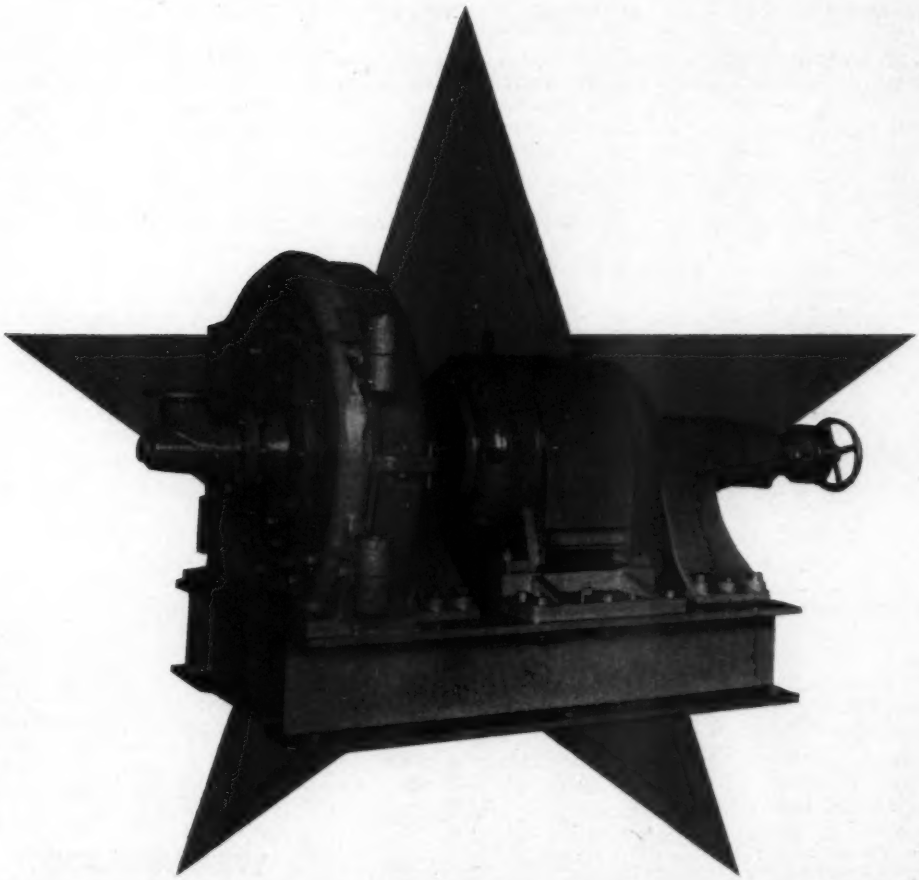
On Friday, May 17, the mill executives heard discourses presented by the students. These included several papers prepared by the students on technical subjects. All were confined to summaries expressed in non-technical language. Dean Lewis presided at the morning session and Dr. Thomas N. Barrows, president of Lawrence College and a director of the Institute, presided at the afternoon session. Students discussed eight papers in the morning session and seven during the afternoon. Luncheon on Thursday afternoon took place at the North Shore Golf Club with Dr. Barrows presiding.

After golfing on Thursday afternoon, mill members attended the



Left—Allen Abrams, technical director, Marathon Paper Mills, and John L. Riegel (right), president Riegel Paper Corp. and president American Paper and Pulp Association, as they conversed during meeting at the Institute. Right—Dean Harry F. Lewis of the Institute staff, explains one phase of the plastic work being carried on in the new Plastics Laboratory of the Institute.

Left—(L to R) Paul Koenig, P. H. Glatfelter Co.; M. Filius, Eastman Kodak Co., and John L. Riegel, president Riegel Paper Corp., and president American Paper and Pulp Association. Right—Four "good fellows" get together: (L to R) Irving McNair, Northwest Paper Co.; E. S. Hooker, T. A. Cook, and F. F. Rawling, of West Virginia Pulp and Paper Co.



A STAR PERFORMER —

On rejects, raw or semi-cooked chips is the Monarch Rotary Disc Mill, Type 36-1.

On Wall Board, Liner Board and Kraft Stocks it demonstrates its best abilities. On any class of screen rejects it is definitely superior.

Its simplicity of design and ruggedness of construction assure a low maintenance expense. Worth-while savings in power have been demonstrated.

Greater uniformity and an improved fibre length are outstanding characteristics of the pulp it produces.

Tell us the application on which you would like our recommendations. No obligation of course.

SPROUT, WALDRON & CO., INC.

Designers — Engineers — Manufacturers

193 Sherman Street **MUNCY, PA.**

closing banquet, also held at the North Shore Golf Club, at which time Dr. Barrows presented trophies to the two best golfers attending the conference. Winners this year were C. L. McNair, Jr., of the Northwest Paper Company, Cloquet, Minnesota, and W. Irving Osborne, Jr., of the Cornell Wood Products Company, Cornell, Wisconsin. Each was awarded a traveling trophy, a wood engraving of "The Papermakers." Following this presentation, guests were entertained by the sleight-of-hand tricks of H. D. Purdy of the Tuttle Press Company, Appleton, Wisconsin.

◆

GIFTS OF $10,000 TO HERTY FOUND. LAB.

Two gifts of $5,000 each have been received by the Herty Foundation Laboratory at Savannah, Georgia, thus assuring the continued operation of the laboratory for the time being. One of these gifts was from General R. E. Wood, chairman of the board of directors of Sears, Roebuck and Company, Chicago; the other came from the State of South Carolina. Plans have been under way for some time looking to the permanent financing of the laboratory established a number of years ago by the late Dr. Charles H. Herty.

◆

N. U. TECH. STUDENTS TO "GO TO WORK"

A plan, whereby theories of books and practices of industry are to be welded, has been formulated at Northwestern University and will be applied in connection with the training of technical enrollees at the university's new Technological Institute now under construction on the Evanston (Illinois) campus.

The plan was outlined recently by Ovid W. Eshbach, dean of the N. U. Institute, who stated that he hopes the new school will be able to produce a superior type of citizen. It is part of the plan to measure each applicant at the beginning and each student must demonstrate his fitness to receive technical training before entrance. The course at the school will last five years and is intended to work so that many of the students will have found their special place in industry before graduation.

Actually, seven working periods of three months are required before graduation. The students will go on a job like any other employee, it was stated, and relationships with various industries have already been established toward this end. The students will go on a job near their homes if possible.

The Institute building will cost about $5,000,000 when completed and will contain 350 individual rooms, three auditoriums and at least 35 laboratories for demonstration and research. It will not be completed until next year. Of the 90 freshmen who entered the institute course last fall, one-half will be at work in industry this summer. It is expected that there will be 500 applicants next fall, 180 of whom will be accepted.

◆

UNIVERSITY OF MAINE OFFERS SUMMER COURSES

Especially designed for paper salesmen, laboratory helpers, etc., are the courses to be again conducted by the University of Maine during the six weeks between July 1 and August 9, 1940.

Two main courses will be given this year; (1) the chemical engineering course which includes laboratory and lectures, the theory of which is based on chemical engineering equipment, and (2) the pulp and paper technology course which includes lectures on pulp and paper manufacture. The latter course also includes laboratory courses in papermaking, pulp coloring and bleaching and paper testing.

In addition to class and laboratory work there will be a number of mill visits. It is pointed out that the University of Maine's summer courses will enable those who have not had an opportunity to obtain a general scientific understanding of the pulp and paper industry, to gain a broad knowledge of the field.

A copy of the summer session catalogue, which explains courses offered, expenses, etc., may be obtained by addressing Director R. M. Peterson, University of Maine, Orono, Maine. Early reservations should be made.

◆

VOCATIONAL EDUCATION CLASS CLOSES

A dinner meeting held at the Black River Country Club on May 22 concluded the spring term of the new Port Huron Vocational Education program for the pulp and paper industry. Under this program, the first and only one of its nature in the State of Michigan, a general, two-year course entitled, "The Manufacture of Pulp and Paper" is being offered to the employees of the local pulp and paper mills, using the open discussion or conference-type class meetings. Mr. Wilbur L. Cassiday, a graduate of the Institute of Paper Chemistry, is instructor and conference leader.

At the dinner their employers, the Dunn Sulphite Paper Company and the Port Huron Sulphite and Paper Company, were hosts to the 92 members of the first class. By this very fine gesture the two paper companies expressed their appreciation of their employees' participation in the Vocational Education program, as well as their own cooperation in it. Executives and foremen of the companies and school representatives brought the total attendance to 120.

The speakers paid a high tribute to Francis Kiefer, vice president of the Port Huron Sulphite and Paper Company, for his untiring efforts in bringing this educational program to a reality, and commended Mr. Cassiday for making it so successful in such a short time.

Seventy-nine members of the class were presented Certificates of Achievement by Dr. George Waters, president of the Board of Education. The certificates were issued by the State Board of Control for Vocational Education.

The meeting was concluded by the showing of the new P. H. Glatfelter Company film entitled, "A Short Course in Paper Making."

◆

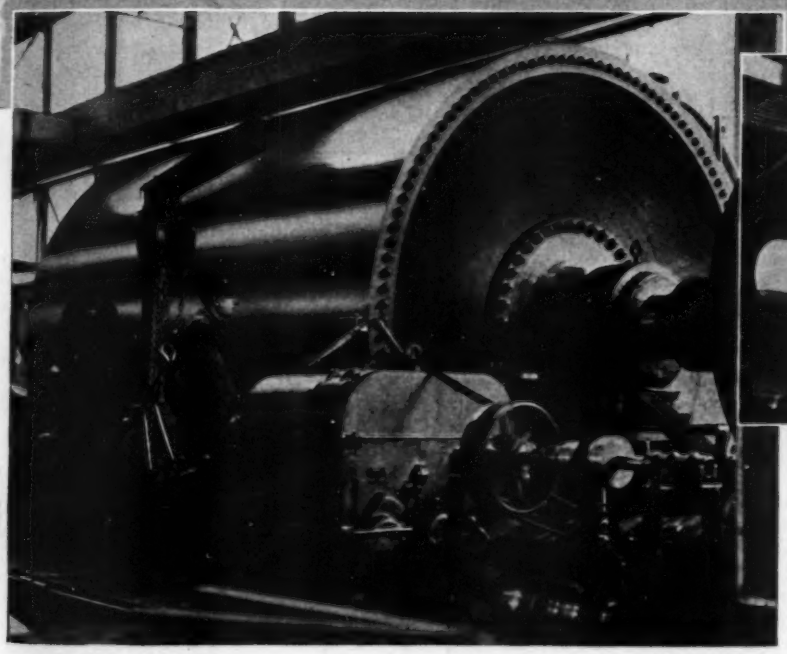
WIS. STREAM POLLUTION COMM. MAKES REPORT

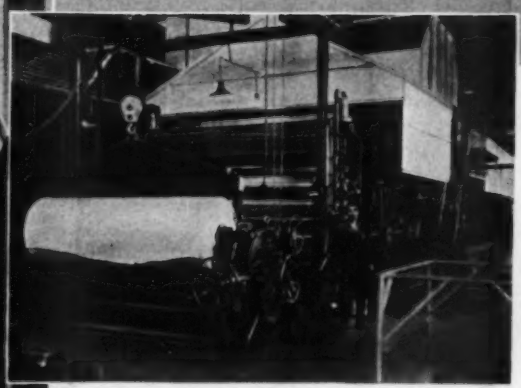
First reports on the progress of the study into the problem of stream pollution now being conducted at the Institute of Paper Chemistry under a committee representing Wisconsin paper mills, was given before the fifth annual executives conference at the Institute on May 15 by J. M. Conway, president of Hoberg Paper Mills. The committee was set up last fall after executives of Wisconsin sulphite mills met with Dr. C. A. Harper of the Wisconsin Department of Health. Technical study of the problem was authorized early this spring (cf. P. I. AND P. W., p. 1232, March, 1940).

Mr. Conway explained the five phases into which the problem has been divided for study. All phases are being conducted at the Institute except the disposal by the activated sludge process, which is being carried on at the University of Wisconsin but which is available to the Institute and which the Institute will pick up in June for study beyond that done at Madison.

Other phases are the disposal by the trickling filter process, study being made of a filter now in operation at the Institute; laboratory study to determine the constituents of waste sul-

. . . another Puseyjones Combination Yankee Machine will soon go into regular operation.





Above is a Puseyjones Yankee Machine in operation.

At left is a special high-speed dryer Grinder for finishing and imparting the glass-smooth polish necessary in making fine M. G. specialties.

THE latest Puseyjones Combination Yankee Machine is now under construction for Compania de Celulosa de Filipinas, Inc., in the far-off Philippine Islands.

Built for the manufacture of high grade M. F. and M. G. specialty papers, this new Yankee machine is similar to a unit that has been in successful operation for Southern Advance Bag & Paper Co., Inc., Hodge, La., since early 1939.

Puseyjones Yankee Dryer Cylinders reflect the experience of nearly 75 years in producing paper-making machinery. Puseyjones special foundry and machine shop facilities permit the manufacture of Yankee Dryers of *all* sizes and highest standards of construction.

Let us give you the facts about the versatility and productive efficiency of the new Yankees built by Puseyjones craftsmen. Write us today.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-making Machinery. Wilmington, Del.

phite liquor causing pollution; economic valuation of all processes for evaporation and burning; and a long range program looking toward the profitable utilization of waste sulphite liquor has been outlined. An outside sanitary engineer has been employed by the committee to work with the staff on the project. Findings belong exclusively to the committee and the contributing mills and no results will be published except upon approval of the executive committee in order to assure accurate reports and forestall any premature or erroneous impressions based on insufficient data.

Mills now participating are: Badger Paper Mills, Inc., Peshtigo; Consolidated Water Power and Paper Company, Wisconsin Rapids; Flambeau Paper Company, Park Falls, Hoberg Paper Company, Green Bay; Kimberly-Clark Corporation, Neenah; Marathon Paper Mills, Rothschild; Nekoosa Edwards Paper Company, Nekoosa; Northern Paper Mills, Green Bay; Rhinelander Paper Company, Rhinelander; and Southern Kraft Corporation, Marinette.

◆

FRENCH TO PLACE NEWSPRINT ORDERS WITH CANADA

Advices from France state that French papermakers are working under considerable difficulties, but that nevertheless their production is estimated at around 70 to 80 per cent of prewar output. Mills with a stock of pulpwood are speeding up production. It is expected that French publishers will place orders with Canada for newsprint because of the uncertain outlook.

Every effort is being made by French pulp importers to secure for their customers, stocks from Europe or North America. It is difficult to find skilled labor in France and now mills are working only 12 to 16 hours a day instead of 24. Orders are being taken without fixing ultimate prices because the prices of raw materials are so unstable.

The prices of newsprint were raised by 460 francs per ton late last October by request of the French Newsprint Bureau. This rise went to another increase of 180 francs by December. The Ministry of Commerce, however, stepped in to authorize an increase of only 250 francs per ton, effective December 1.

In December the Inter-Ministerial Commission of the French Press announced that all periodicals would reduce their sizes so as to effect a saving of 25 per cent in newsprint consumption.

BL. SULPHITE PULP UP $11 PER TON

Increase of $11 per ton in the price of bleached sulphite pulp to $72.50, effective three months beginning July 1, was announced on May 31 by the Canadian International Paper Company. The announcement stated that the price was for 2,000 pounds of air dry weight based on Atlantic ports in the United States. It was also announced that Rayonier had increased rayon pulp $5 per ton. Rayon pulp prices will range from $75.

◆

CANADIAN MILLS PLAN EXTENSIVE AID TO BRITAIN

Plans are now under way to start shipments of newsprint from Canada to the United Kingdom, under the terms of the new contract for a large additional supply arranged by the British Ministry of Supply. A special body has been organized to represent the Canadian newsprint industry and will be known as the European Supply Committee. R. C. Doane, of the International Paper Company, is chairman of this group. The committee will work in co-operation with twelve leading British publishers organized under the name of Newsprint Suppliers, Ltd., of which Lord Beaverbrook is chairman, 250,000 short tons are called for by the end of 1940 in the contract.

The contract will mean a substantial addition to the operating ratios of Canadian mills for the balance of the year, over and above the April ratio for shipments of 72.9 per cent of installed capacity.

The arrangement may involve the taking over by Canadian mills of some 40,000 to 50,000 tons now being delivered by the Corner Brook mill, Newfoundland, to markets other than British. Obviously, this will be done in order that the Newfoundland mill can aid Great Britain by this added tonnage and the utilization of its own boats.

CUSTOMS NEWS

Customs officials, according to Warren B. Bullock, manager of the Import Committee of the American Paper Industry, have indicated their willingness to accept the new Canadian freight classification of cull news for paper stock, when so described on consular invoices, as a means of expediting shipments of such material to American paper mills. The new Canadian freight classification description reads "waste newsprint paper (damaged and mutilated)," and the Customs officials indicate that the use of essentially the same description on waste paper shipments would facilitate its importation duty free as paper stock, particularly if the invoices carry the added phrase, "fit only for use as paper stock for re-manufacture."

In order to expedite shipments of standard newsprint through border ports, some Customs officials are asking for co-operation of Canadian shippers by providing them with complete descriptions of the paper shipped to this country and in some cases, samples of typical shipments. This is done on the principle that if the suggestions of the officials are complied with, delay of any shipments for inspection and examination will be reduced to a minimum. Compliance with the requests of the officials will be to the advantage of the shippers and users of such paper. The domestic industry will not be affected by legitimate shipments. On the other hand, if the shipper makes a false declaration, the paper may be seized and penalties imposed.

▶▶▶ THE UNITED STATES CUSTOMS COURT has sustained the action of Customs officials in imposing a countervailing duty on German goods purchased at low prices by barter transactions. While the case on trial involved a shipment of chinaware, the principle applies to all German merchandise so purchased. This action by the Government was based on the position taken by the Import Committee of the American Paper Industry when the German barter practice was first initiated.

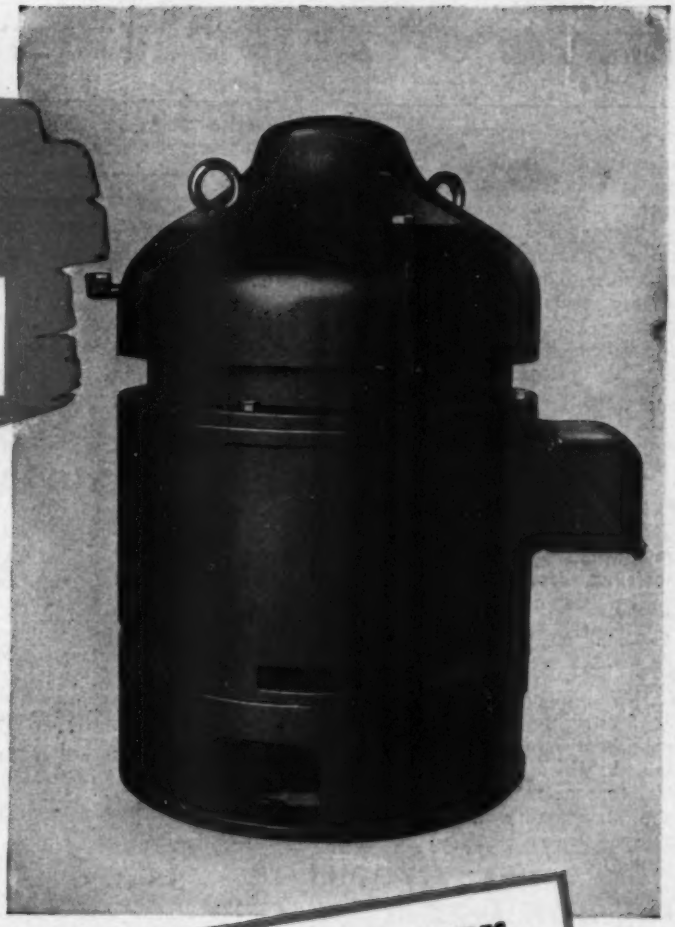
▶▶▶ IMPORTS OF PAPER FROM JAPAN increased in the last quarter of 1939 as compared with the third quarter of that year, according to a report issued by the Import Committee. Imports are chiefly of Japanese type tissue papers, such as copying tissue, coffee filters, etc. The total for the year was about 600 tons, valued at $420,000. This value, however, is based on a very low production cost, the average Japanese paper maker's earnings being only 52 cents per day of over eleven hours.

Japan's total imports of paper in 1939 were only 950 tons, while the exports for the last quarter alone were 56,000 tons. Imports of paper into Japan decreased one-third in 1939 as compared with 1938, but exports increased heavily. About one-fifth of the exports were of Japanese style papers, especially tissues, England taking materially more than the United States, while most of the balance went into Asiatic markets.

Costs Go DOWN

when

G-E VERTICAL MOTORS Go to Work for You



HERE'S why: You CUT INSTALLATION COST because the design features make possible *easy* assembly and pump shaft adjustment; also, the shielded construction permits outdoor installation in moderate climates without the expense of a pump house. You GET MORE OUT OF YOUR PUMPS because the high full-load speed permits pumps to operate at a high output rate. You are assured LOW MAINTENANCE EXPENSE because of the reliable, trouble-free records G-E vertical motors have established.

In addition, the low fan and bearing losses of these motors permit them to operate at high efficiency; this means a SAVING IN POWER COST.

Would you like a FREE COPY of our NEWEST publication (GEA-1368D) describing G-E vertical hollow-shaft motors? Call the nearest G-E Office, or write General Electric, Schenectady, N. Y.

You Save On

- POWER
- PUMPING
- MAINTENANCE
- INSTALLATION

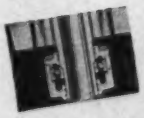
LOOK AT THESE NEW FEATURES

Moisture-resisting Insulation

Pin-type Coupling

Oil-lubricated Thrust Bearings

Carefully Balanced Rotor



Dripproof, Ball-type Guide Bearings

THERE'S A G-E VERTICAL MOTOR FOR EVERY NEED

GENERAL ELECTRIC

750-8

VIEWS OF NEW SULPHITE PULP MILL OF

▶▶▶ WAGE INCREASES and a week's holiday with pay for employees with the company more than a year have been granted to some 3,000 workers at the Abitibi Power and Paper Company. The wage increase amounted to two cents an hour. The wage agreement covers mills at Fort William, Port Arthur, Sault Ste. Marie and Iroquois Falls, all in Ontario; and Pine Falls, Manitoba. The Abitibi organization plans the construction of a new marine railway in the vicinity of Orient Bay, Lake Nipigon district.

◆

▶▶▶ THE PULPWOOD SUPPLY COMPANY, organized to construct and operate a chemical pulp mill at Schreiber, Ontario, will defer erection until a later date.

◆

▶▶▶ THE NEWSPRINT SUPPLY COMPANY, a co-operative enterprise of Scottish and English newspaper publishers, has taken delivery of 10 ships in which to import some 3,250,000 tons of newsprint from Canada and Newfoundland. First deliveries are expected in July.

◆

▶▶▶ A NEW ADDITION to the wharf and stackers at the Howard Smith Paper Mills, Cornwall, Ontario, is now being effected. The contract was awarded to the Foundation Company of Canada, Montreal.

◆

▶▶▶ A NEW MILL for the production of cellulose products is being planned by the Burgess Cellulose Company, Ltd., Toronto. The mill will cost some $50,000.

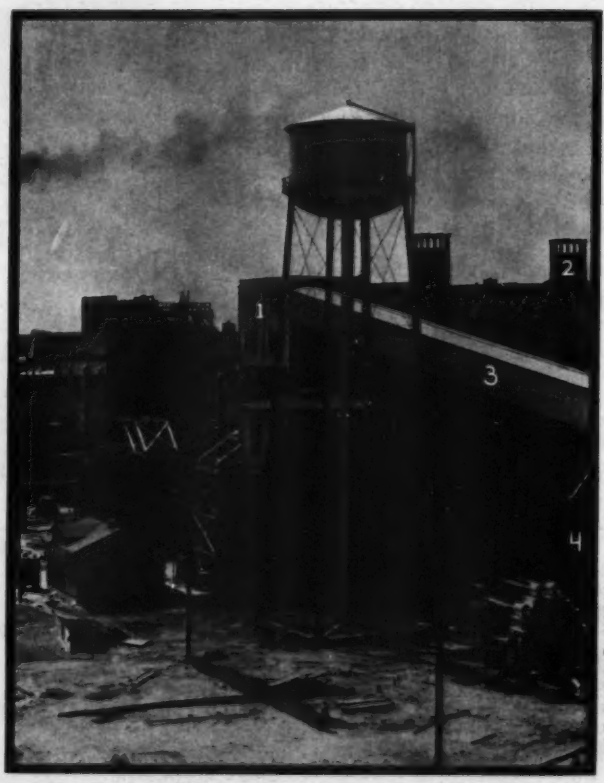
◆

▶▶▶ DONNACONNA PAPER COMPANY, Donnaconna, Quebec, is considering plans for the construction of a one-story addition to the finishing division. It is reported to cost over $50,000 including equipment.

◆

▶▶▶ A PLANTATION of some 400 trees including jack, red and white pines, white spruce, balsam fir, Scotch pine, Norway spruce and European larch, has been made in the ravine at the rear of the Institute of Paper Chemistry, Appleton, Wisconsin. The Institute also recently completed a new building to house the expanded plastics laboratory.

Only mill in Deep South producing sulphite pulp from Southern Pine. Daily output about 200 tons of rayon pulp.



ABOVE—
General view of mill. (1) Portion of water treating plant; (2) office and laboratory; (3) storeroom and maintenance shops; (4) digester building; (5) vomit stacks leading from blow pits; (6) blow pits; (7) acid towers.

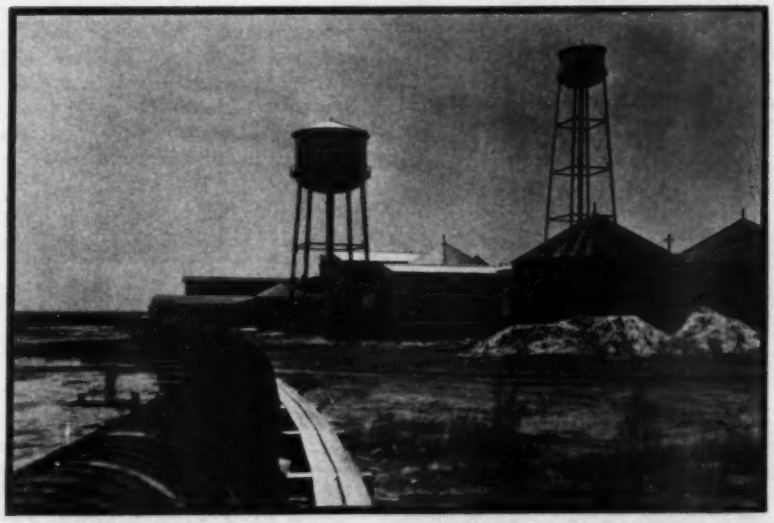
◆

LEFT—
Digester building with 10,000 gallon elevated water tank. (1) Digester building; (2) one of the vomit stacks; (3) chip conveyor bridge; (4) one of the blow pits.

▶▶▶ THIS MILL IS BUILT on the Amelia River, a tidal stream which is Fernandina's harbor. The plant which cost approximately $8,000,000, went into production the latter part of 1939. Rust Engineering Company was in charge of construction; Merritt-Chapman & Scott Corporation were the contractors. Rayonier sent experienced men from its western plant to Fernandina to take charge of production.

(Photographs courtesy of Chicago Bridge and Iron Company)

Rayonier, Inc., FERNANDINA, FLORIDA



LEFT—(above) Close-up of water treating plant. (center) Barking drum installation showing supporting framework and drive arrangement. (below) Fuel oil storage tank of 35,000 barrel capacity. Warehouse building and finishing room in background.

▶▶▶ NEW EQUIPMENT is being added and extensions are being made to the Provincial Paper Company mill at Port Arthur, Ontario, with the object of improving grades of paper manufacture. The work is being done by the company's own staff at a reported cost of $150,000.

◆

▶▶▶ A THIRD DEEPWELL has been drilled by the Crown Willamette Paper Company division of Crown Zellerbach Corporation's mill at Camas, Washington, bringing to 8,000,000 gallons per 24-hour day, the amount of water available. The water is absolutely pure, requiring no treatment, and maintains a constant temperature of 51 deg. F. the year around.

◆

STRINGENT RESTRICTIONS of the use and manufacture of paper are now in force in Great Britain. The most far-reaching of four new orders, prohibits the issue of new periodicals or certain types of posters and circulars and the manufacture of certain types of paper goods including paper handkerchiefs, tablecloths, cups, plates, confetti, etc.

◆

▶▶▶ PLANS ARE UNDER WAY for the erection of a new plant at Modern Containers, Ltd., Ottawa, manufacturers of corrugated paper boxes. The plant will cost around $50,000 and will be a one-story construction.

◆

▶▶▶ A FLAT WAGE INCREASE of two cents an hour to all hourly-paid workers in the Gatineau (Quebec) mill of the Canadian International Paper Company, went into effect on May 2.

◆

▶▶▶ A LATE REPORT states that the Stronach Paper Company, Rochester, Michigan, was recently taken over by the Rochester Insulating Material Company at that town, which company will re-open the plant to make board for insulating material.

CONVENTIONS AND COMING EVENTS

June 18-20 — American Pulp and Paper Mill Superintendents Association, Annual Meeting, Netherland-Plaza Hotel, Cincinnati, Ohio.

Aug. 20-23—Technical Association of the Pulp and Paper Industry, Fall Meeting, Seattle, Washington.

Sept. 9-13—American Chemical Society, Fall Meeting, Detroit, Michigan.

Sept. 18—National Industrial Advertisers' Association, National Conference of Industrial Advertising and Marketing Executives, Detroit, Michigan.

Oct. 2-5—Electrochemical Society, Fall Meeting, Ottawa, Canada.

Oct. 7-11—National Safety Congress and Exposition, Stevens Hotel, Chicago.

Dec. 2-7—Fourteenth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York City.

◆

BOOM COLLAPSE CAUSES MIXUP ON AROOSTOOK RIVER

The collapse of a boom on the Aroostook River in Maine resulted in a loss of 10,000 cords of pulpwood in four-foot length, it was reported recently, as Frank Pierson, assistant general manager of the Great Northern Paper Company at Millinocket, took charge of salvage operations. The Great Northern concern sponsored a 60,000-cord spring drive on the river. Salvaging operations were expected to cost at least $40,000.

It was stated that about 2,500 cords of the runaway pulpwood rushed down into the St. John River where it mingled with a drive of the Port Royal Pulp and Paper Company, Fairville, N. B. When it was found that separating of the two companies' logs would be almost impossible, the Great Northern company sold the wood to Port Royal.

◆

H&W GIVES FURTHER CONTRACT TO RUST

The contract for the construction of a laboratory, a time office and a locker building at the Hollingsworth and Whitney Company's new Mobile (Alabama) plant has been awarded to the Rust Engineering Company. These are the last structures that will be put up in connection with the mill's construction, thus rounding out plans for a complete white paper unit that is costing the Boston concern $5,000,000.

The mill development is now about 85 per cent completed and actual production should start in August or September. There are fifteen buildings being put up at the Mobile site. Construction of the mill on a large site in Mobile's Magazine Point industrial section marks the first entrance of H. and W. in the southern papermaking field. Samuel DeForest is in charge of Mobile operations. The Rust Engineering Company has done most of the construction with the exception of roofing, piping, glass, electric and similar work. Hardy S. Ferguson and Company is the architectural and engineering firm.

◆

INSTALL BELOIT YANKEE DRYER AT CAMAS MILL

A 12-foot Beloit Yankee dryer for the No. 11 paper machine in the Camas (Washington) plant of the Crown Willamette Paper Company division of Crown Zellerbach Corporation, was installed last month. The dryer is the largest single piece of equipment ever purchased by the company. The installation was made to improve the quality of tissue made on the No. 11 machine. The machine's speed is to be stepped up from 1,000 to 1,100 feet per minute.

Improvements on No. 11 were part of a remodeling program affecting four machines, including Numbers 7, 9 and 10. A new slice and head box have been installed on No. 11 and the old equipment will be installed on No. 9. The speed of this machine will be upped 100 feet per minute to 925. A Beloit Yankee dryer was also installed on the No. 7 machine.

◆

FINANCIAL

The German invasion of Belgium and the Netherlands and the consequent broadening of the war with the Allies caused a slump in securities, at times approaching a small panic. Despite the fact that paper mill earnings have held up well, and that production to fill orders is at a high percentage of capacity, paper mill securities fell with the rest of the securities market.

A. P. W. Paper Company—Net profit for the first quarter was $9,879, as against $26,321 for 1939.

Certain-teed Products Corporation—Net profits for the March quarter were $149,062, as against a loss of $148,659 in the comparable quarter of 1939.

Crystal Tissue Company—Net profits for the March quarter were $34,028, as against $18,480 for the same quarter of 1939.

Dixie-Vortex Company—Net profit for the year ending March 31 was $858,385, as against $719,548 for the preceding year.

Robert Gair Company—Net profit for the March 31 quarter was $203,958.

Hammermill Paper Company—Net profit for 1939 was $1,765,693.

Hinde and Dauch Company—Net profits for the March quarter were $208,233, as against $152,575 for the same quarter of 1939.

International Paper and Power Company—Net earnings for the first quarter were $2,960,573, as against $12,428 the same period of 1939.

Lily-Tulip Cup Corporation—Earnings for the year ending March 31 were $661,677.

Nashua Gummed and Coated Paper Company—Net profit for the March quarter was $44,288, as against $30,775 for the comparative 1939 quarter.

National Container Company—Net profit for the March quarter was $202,117 as compared with $51,076 for the same quarter of 1939.

Oxford Paper Company—Net income for the first quarter was $136,827, as against $111,615 for the same quarter of 1939.

Paraffine Companies—Net profit for the first quarter was $361,874, as against $336,398 for the comparable quarter of 1939. Nine months earnings to March 31 were about $400,000 above the same period a year ago.

Puget Sound Pulp and Timber Company—First quarter earnings were $266,286. A 75 cent dividend was declared on the common stock, as against a previous quarter payment of 50 cents.

Scott Paper Company—First quarter net earnings were $379,239, as against $288,983 for the same period of 1939. Net sales for the quarter were over $5,000,000, a gain of over $1,000,000 from the same quarter of the preceding year.

Soundview Pulp Company — Net profits for the four months to April 30 were $737,800, as against $80,669 for the same period in 1939.

Union Bag and Paper Corporation—Profits for the first quarter were $725,431, as compared with $153,489 for the same quarter of 1939.

Among dividends declared by various paper companies are the following: Whitaker Paper Company, quarterly $1 on common stock; Masonite quarterly dividend of 25 cents plus an extra dividend of 25 cents on the

common stock; Champion Paper and Fibre Company, 25 cents on common stock, quarterly, as against previous payment of 15 cents; Kimberly-Clark Corporation, regular quarterly dividend of 25 cents on common stock plus extra dividend of 25 cents.

Southern Advance Bag and Paper Company has made formal offering of $3,200,000 in 4½ per cent first mortgage sinking fund bonds, due 1955. The funds thus secured will be applied toward the redemption at 102 of nearly $2,000,000 in outstanding 6 per cent bonds and a smaller proportion for the redemption at 103 of a later maturity of 6 per cent bonds.

New York Stock Exchange—Stocks

	Closing Prices May 25 1940	April 25 1940
A. P. W. Paper Co.	2	*3½–3⅞
Celotex	5⅜	10¾
Same Preferred	58½	*67–70
Certain-teed	4⅜	6⅞
Same Preferred	18¼	32¼
Champion P. & F. Co.	19	28¼
Same Preferred	100¾	*105⅛–105¼
Container Corp.	11¼	19
Cont. Diamond	5⅜	8⅞
Crown Zellerbach	13½	19
Same Preferred	78	93⅜
Dixie Vortex	.....	13½
Same "A"	31½	37⅜
Flintkote	11¾	18⅞
Robert Gair	2½	4⅞
Same Preferred	11	19
Gaylord Container	10⅛	14½
International P.&P. Co.	12	19⅜
Same Preferred	45½	70⅝
Kimberly-Clark	29¾	44
MacAndrews & Forbes	24	33½
Masonite	23	32⅞
Mead Corp.	8	13⅝
Same 6% Preferred	.....	79½
Paraffine Co.	29	42⅛
Same Preferred	.....	*100–101½
Rayonier	14⅞	25⅜
Same Preferred	24⅞	33¾
Scott Paper	37¾	43
Same Preferred	110	*112–112¾
Sutherland Paper	20	28⅜
Union Bag & Paper	10¾	18
United Paperboard	3½	*6–6¼
U. S. Gypsum	57½	82
Same Preferred	165	*173–179

New York Stock Exchange—Bonds

Celotex 4½%	80	88½
Certain-teed 5½%	66⅛	80¾
Champ.P.&F.Co.4¾%	104½	105
Container Corp. 5%	101	101¼
Inter. P. & P. 5%	99½	103⅜
Same 6%	92½	102½

New York Curb Exchange—Stocks

Am. Boxboard	4⅛	7½
Brown Co. Pfd.	16½	32
Det. Paper Prod.	¾	1
Great Northern	38	*48–48⅜
Hummel Ross	5⅜	7⅜
Nat. Container	9	13¼
St. Regis	2¼	4⅛
Taggart	3⅛	*5–5¼
United Wall Paper	1¾	2¼

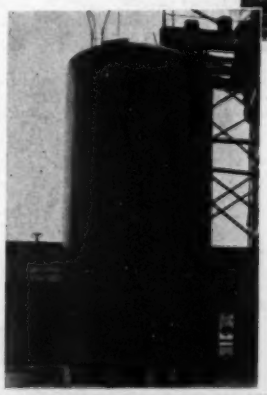
* Closing Bid and Asked Prices.

FLAT BOTTOM STORAGE TANKS
for Paper Mill Requirements

● *Shown above is a group of four tanks used for liquor storage at the Brunswick Pulp & Paper Company mill, Brunswick, Ga. In the background is a 50,000-gal. elevated water tank.*

● *At the left is a 40 ft. dia. by 20 ft. water storage tank used for the fire pump supply at the Crossett Paper Mill, Crossett, Ark.*

● *The view at the right shows two 33 ft. dia. by 13 ft. 6 in. tanks used for black liquor storage at the Kraft Corporation mill, Fernandina, Fla. Directly below is a 40,000 gal. hot water storage tank at the same location.*



THE accompanying illustrations represent a typical cross-section of the various types of flat-bottom tanks for liquid storage that are being fabricated in our shops for the paper industry. All of these installations are of modern welded steel construction, designed and built to meet specific requirements. In addition to flat-bottom tanks for water or chemical storage, we are completely equipped to furnish elevated water tanks, diffusers, reservoirs, steel smoke stacks, bins, digesters, cookers, and standpipes. Address our nearest office for information or quotations.

CHICAGO BRIDGE & IRON COMPANY

Cleveland.....2367 Rockefeller Bldg.
Birmingham.....1811 North Fiftieth Street
Tulsa.....1651 Hunt Bldg.
Houston.....918 Richmond Avenue
Detroit.....1566 Lafayette Bldg.
Philadelphia.....1653-1700 Walnut Street Bldg.
Boston.....1562 Consolidated Gas Bldg.
Los Angeles.....1459 Wm. Fox Bldg.
Chicago.....2445 McCormick Bldg.
New York.....3350-165 Broadway Bldg.
Dallas.....1446 Praetorian Bldg.
San Francisco.....1017 Rialto Bldg.

Plants at Birmingham, Chicago and Greenville, Pa.

TO ATTAIN

ECONOMY

UNIFORMITY

CLEANLINESS

EFFICIENCY

USE

PMC

PREPARED

ROSIN SIZE

YOUR ORDER OR INQUIRY WILL BE HANDLED PROMPTLY BY THE NEAREST OFFICE

PAPER MAKERS CHEMICAL DEPARTMENT

SUPERIOR PMC CHEMICALS

REG. U. S. PAT. OFF.

HERCULES POWDER COMPANY
Incorporated

KALAMAZOO, MICHIGAN

Stoneham, Mass.
Holyoke, Mass.
Albany, N. Y.
New York, N. Y.
Wilmington, Del.
Atlanta, Ga.
Savannah, Ga.
Jacksonville, Fla.
Pensacola, Fla.
Marrero, La.
Milwaukee, Wis.
Chicago, Ill.
Portland, Ore.
San Francisco, Calif.
Freeman, Ont.
Erith, England
The Hague, Holland

PM-71

Editorial ★ ★ ★

The World Demands American Pulp and Paper

▸▸▸ THE TURN OF EVENTS in Europe during the past month should convince the most skeptical paper merchant, converter, paper manufacturer and even paper consumer that the "wistful wishing" for increased imports of Scandinavian pulp is futile.

The plain, unvarnished truth of the matter is that no exports of Scandinavian pulp and paper may be expected until some time after hostilities in Europe have ceased.

In the meantime, all stocks and reserves of pulp have steadily dwindled, and although our domestic pulp mills have run to full capacity during the past five months, all output has found ready markets, and pulp prices have advanced surely and steadily. June and July will witness an acute shortage of pulp and a consequent shortage of paper.

On the eastern and western seaboards, all domestic producers of pulp are flooded with orders for pulp which they cannot book despite the fact that buyers have pushed prices up to the $70 per ton basis and higher. Buyers from foreign countries are in the country personally canvassing every pulp mill, large and small, for parcels of pulp for prompt shipment. They offer cash with the order, with no disputes as to price or delivery date. As pulp is becoming harder to find, these buyers are now submitting attractive offers for paper.

They need pulp from this country to keep their paper mills running, but as pulp is unavailable, they are now buying paper and shutting down their home mills by taking American papers in constantly increasing volume. And, in this way, they are securing the paper their countries so sorely need.

This is especially true of paper and pulp supplies for Great Britain and France. Since they cannot get sufficient pulp to run their mills, they need not go without paper because paper is cheaper than pulp in this country. Pulp, under the upward pressure of an insatiable demand, has advanced to such high prices that it already commands the domestic prices for paper in many cases. This is an unprecedented anomaly, and one which will have to be adjusted speedily. Paper prices must advance to a basis that will represent the replacement price of pulp; otherwise, the world demand will absorb our paper production as it is absorbing our pulp.

June and July will see this readjustment take place for paper inventories are decreasing, paper consumption is increasing, and the exports of paper by the United States are dramatically gaining every week.

School is Out!

▸▸▸ THE MONTH OF JUNE to school children of this country is the month when school lets out. The daily grind of study, recitation, and examination is over for another school year. Ahead are weeks of vacation. Some children will spend these weeks in one way; some, in another. Some will travel; others will stay at home to help mother or father, or both; some may find employment and learn for the first time the real meaning of earning a living; others may just loaf. Whatever they do, it is a change from school routine, and the change is just as necessary to the well-being of the individual as is schooling itself.

Industrial executives can learn much from this common vacation policy of our schools. It is not so much the closing of school as it is that time is given the children by so doing to do other things than those which they have to do in the course of daily schoolwork.

No matter how pleasant the job, or how much the worker likes it, there are times when the job becomes just a humdrum task. To prevent this mental condition from developing in the individual worker, or at least to minimize the frequency of its occurrence means more efficient production and a more contented working force.

Some mill officials apparently have appreciated these assets, and in order to realize on them they have developed a regular vacation policy for all of their mill employees. Other mills may have considered the possibility of a vacation policy for their working forces, but have not formulated any plans for carrying out a program of this kind If your mill happens among the delinquents, wouldn't it be a good idea to re-open the issue and, in the light of more experience, consider again its possibilities. Should the decision be favorable, there is yet time to put a plan into effect this year.

ADVERTISING PAGES REMOVED

CURRENT THOUGHT

AMERICAN INDUSTRY—PREPARE!

WILLIAM SIBLEY

▸▸▸ IT IS IMPRESSIVELY CLEAR that the distressing events abroad have brought a new war consciousness to America, and with it an entirely justifiable defense consciousness. More and more America is realizing that regardless of the outcome of the European struggle—whether the Germans win or are whipped; whether there be an armed truce for a period sufficiently long to permit the belligerents to rebuild and restock essential war machines, or whether there be a peace dictated by some dictator—all American industry faces boom times. But unfortunately, much of American industry is in no condition to "boom". The defense program recently inaugurated (a program so tremendous it is doubtful if we now realize just how big it is) catches nearly all industry "behind the eight ball." We have neither the machine nor man power to produce the demanded goods and materials at the speed and in the quantities now on schedule. Seventy per cent of all machine tools now in use in America are over ten years old. Unfortunately, while that single industry may not be typical of all industries, it is far from being exceptional. President Roosevelt has spoken, publicly, of a plan for producing fifty thousand airplanes every year. If we had the airports to carry them, the pilots to fly them, and the factories in which to produce them, the shortage of trained men to make them would render such a production plan impossible.

All American industry now faces the necessity for girding for high-speed, large-quantity production. All America now faces the necessity for realizing that, at long last, the depression is over. True, we yet have too many millions of unemployed but with the immediate imminent industrial activity, plus the throwing open of the enlistment offices, our army of unemployed presently will be reduced to only a few battalions of those who are chronically unemployed regardless of economic conditions. With the advent of our forthcoming defense building program we will be putting back to work the men who operate punch presses, turret lathes, or handle the molten metal ladels in steel plants and foundries. And for every man so put to work, seven more must go to work to keep him supported in essential materials. For every man in creative industry, there must be seven more in the business of raw material and machinery supply, distribution, transportation, sales, accounting, advertising, and all other divisions of industry. Therefore:—put 1,000,000 men to work in creative industry and automatically our army of unemployed disappears.

There is no doubt that American industry will come forward with the necessary productive capacity. It always has, and so long as America remains America, it always will. But this is the period of rejuvenation. We have much obsolescence to charge off. We have many machines to scrap—then replace with those which are more efficient. Because—we have no time to lose, we have got to hurry. Our 10-year-old machine tools and our 20-year-old locomotives must give way for those which will do the job faster, better and cheaper. Time—production time—is now the prime essential of American industry. First costs, sources of supply, and other usual business considerations and influences fade before the necessity for faster, faster, faster production.

But haste must not result in waste. Every man-hour, every machine-hour, should be so jealously guarded that each one will be registered in finished production. Valves which leak and waste water; belts which slip and waste power; wire rope that snarls and kinks and wastes men's time and machine production; steam cocks which hiss and waste coal; all these and a thousand other details of production must be watched, corrected and controlled. The war of production ahead has as its determining factor the single factor of economics, just as has the war of armies today in Europe. The nation with the greatest storage of gasoline or the surest supply of rubber is the nation that wins—in Europe. The plant with the least waste and the smallest amount of machine interruption is the plant that will win in the American war of production.

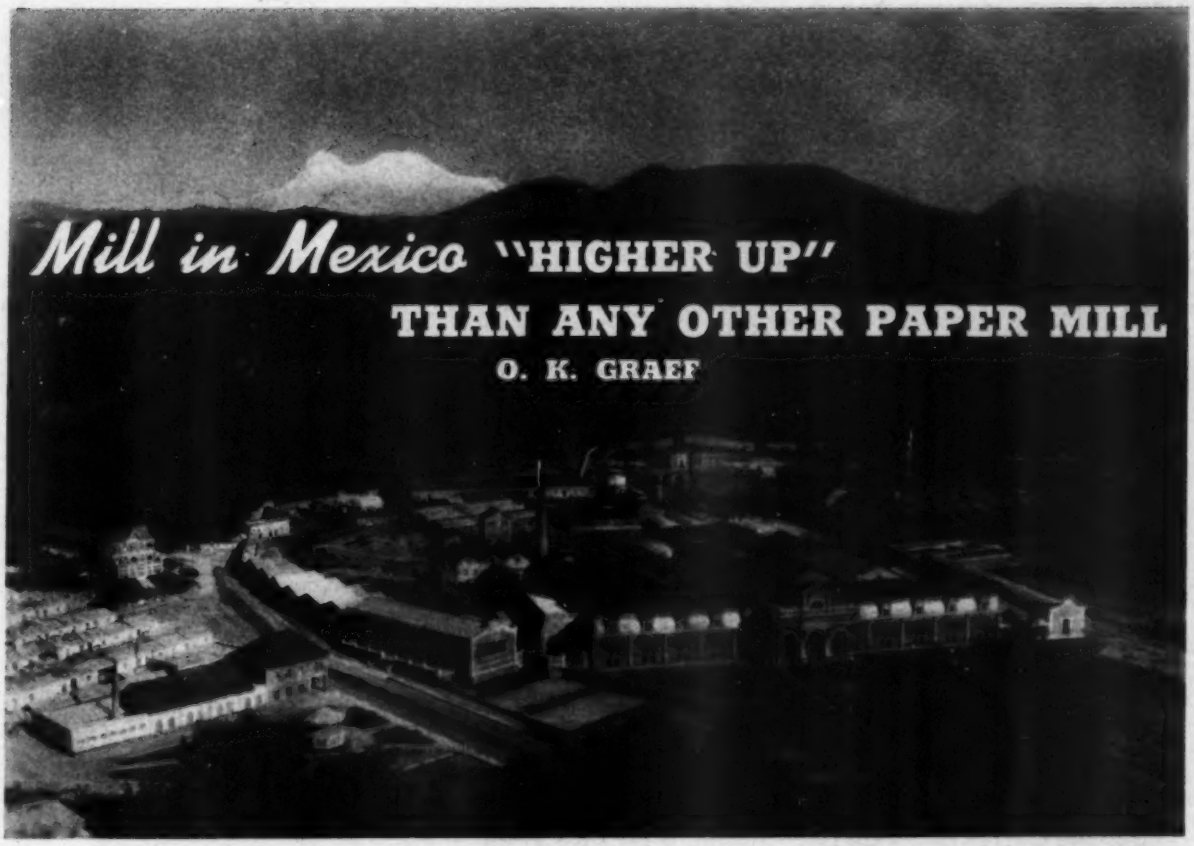
But in addition to fast and accurate production it is vitally important that we fully realize exactly what we are seeking to protect with our production. We are seeking to protect the American standard of living. A way of life that gives those who reside here more goods, more leisure, more opportunity, more of everything that is desirable than those who live anywhere else on earth. And that way of life is dependent, solely and completely, on the American system of free enterprise.

Every thinking business man knows that our American system is not so thoroughly understood as it should be. Every thinking man knows, also, that this lack of basic understanding constitutes a very real threat to the continued existence of our system—that business and industry must make sure it is understood, comprehensively, if it is to be retained. The defense of American industry and enterprise will still have to be fought on the battleground of economic illiteracy.

With the spotlight swinging more and more to the international scene and situation, we dare not forget the prime importance of our own urgency for action on this side of the Atlantic. We must defend America within America. Moreover, if America is to accomplish the gigantic task immediately ahead, we must have national unity based on confidence and mutual understanding between the three elements of all life: *industry, labor* and *government.* In the fight for faster and faster production which is upon all American industry today (and tomorrow), we must also have unity of thought and action between employer and employee, between labor and capital, between industry and government. *Let us start now to defend ourselves.*

Mill in Mexico "HIGHER UP" THAN ANY OTHER PAPER MILL

O. K. GRAEF



▸▸▸ THERE IS HARDLY ANY BUSINESS that is more dependent upon location and the forces of nature than the pulp and paper manufacturing industry. In the early days of the wood pulp industry, mills were built along streams principally because water furnished cheap power to run the mill and the water needed for processing was close at hand. Also, logs were floated down streams from forests where there was thought to be an unlimited supply of raw material. But although steam and electricity have drawn mills to better commercial locations and transportation has brought raw materials to them from far away points, *paper mills still need water*—water is a prime requisite wherever pulp or paper is made.

The story of its water supply and how that supply is brought into the San Rafael mill on the slopes of the Volcano Ixtaccihuatl in San Rafael, Chalco District, State of Mexico, on the San Rafael & Atlixco Railroad is probably one of the most unusual descriptions of such a system that could be found in any paper mill.

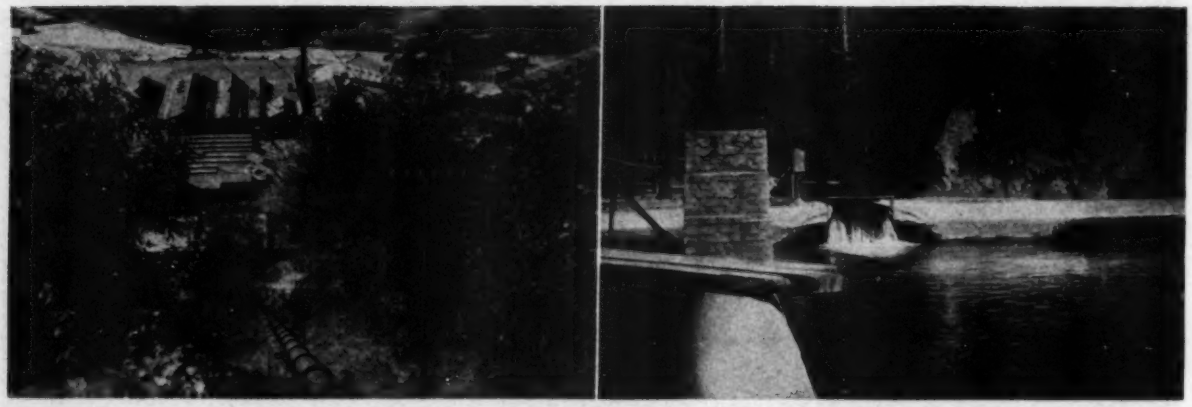
The San Rafael mill is located in a beautiful canyon over 8,300 feet above sea level, which, it is believed, gives this mill the distinction of being located at a higher altitude than any paper mill in the world.

Water for hydraulic power and process purposes is drawn from the melting snow cap of the Volcano Ixtaccihuatl through a series of carefully engineered canals and tunnels built of brick, concrete and rubble masonry, nearly 11½ miles in length. Full utilization of the head is made by means of five hydroelectric power plants located along the canals at strategic points. The heads available at the various stations are: Nos. 1 to 5, located at 1,300 ft., 975 ft., 200 ft., 450 ft., and 325 ft., respectively. The average flow is in the neighborhood of 65 gallons per second, which produces about 40 horsepower per second in effective work per gallon of water, or approximately 2,600 horsepower per second for the system.

The company owns large timber reserves on the slopes of the volcanoes Ixtaccihuatl and Popocatepetl, although at the present time the wood supply is being taken from the slopes of the extinct volcano, Nevado de Toluca, some seventy-five miles to the west.

In order to avoid the possibility of a future timber shortage, the company has set up a forestry section which works in close harmony with the Government on an extensive reforestation program. A native tree, similar

The author has been associated with the industry in the States for a number of years; he has been close to its progress and activities, and this interest and knowledge made a recent visit to a mill in Mexico highly interesting and most informative. For that mill is unique—both from the standpoint of location and the utilization of natural forces, and because the most ingenuous planning known to engineering was put into its construction.



Left—Hydraulic power pipe and view of plant from forebay. Right—Forebay.

to our spruce, called Oyametl *(Abies Religiosa)*, has been found to be excellent for papermaking when grown at these altitudes.

Since 1925, the forestry section has gathered 200,000 quarts of Oyametl seed and 4,000 quarts of pine, oak and cypress seeds. These have been planted, and from the seed farms, two and one half to three million seedlings of Oyametl and four hundred thousand seedlings of other species, including eucalyptus, have been transplanted to the forest properties. The fixed policy of the company is to plant ten trees for every one cut down.

Wood is stored in a modern and extensive woodyard, where it is sawed to length and then floated down hydraulic conveyors to the woodroom. Two American barking drums, together with a series of hand barkers and Green Bay barkers, prepare the wood. It is then floated in adequate flumes to the wood storage or to the chippers.

The groundwood mill contains thirteen four-pocket grinders. Raw pulp from the bull screens is fine-screened through Impco centrifugal screens. Two refiners and a hog repulp the screen rejects which are returned to the system.

Such pulp as is not required for use in the paper mill at once, is lapped for storage and shipment to the Progreso mill. A Kamyr wet press is also available but is not used unless necessary, as at the high altitude, simple press rolls seem to extract more water from the sheet than do suction boxes, and the mill finds that fully as dry pulp can be produced from press type machines at less cost.

Probably the most interesting feature of this groundwood mill is the fact that all processes from the time the wood leaves the woodyard are accomplished by gravity. No pumps are used in any stage, except for the return of repulped stock or white water to a point higher up in the system. This arrangement is made possible, of course, by the location of the mill on the steep mountain slope.

High up on the slope behind the mill is the sulphite acid plant, which consists of a two-tower system installed some years ago by Stebbins Engineering Company. Two rotary sulphur burners using Texas sulphur, are employed to produce the gas which is cooled in a modern cooler and pumped to the towers by a pair of positive type rotary pumps. Limestone, low in magnesium, is obtained within a few miles of the plant, and is of high quality for acid-making purposes.

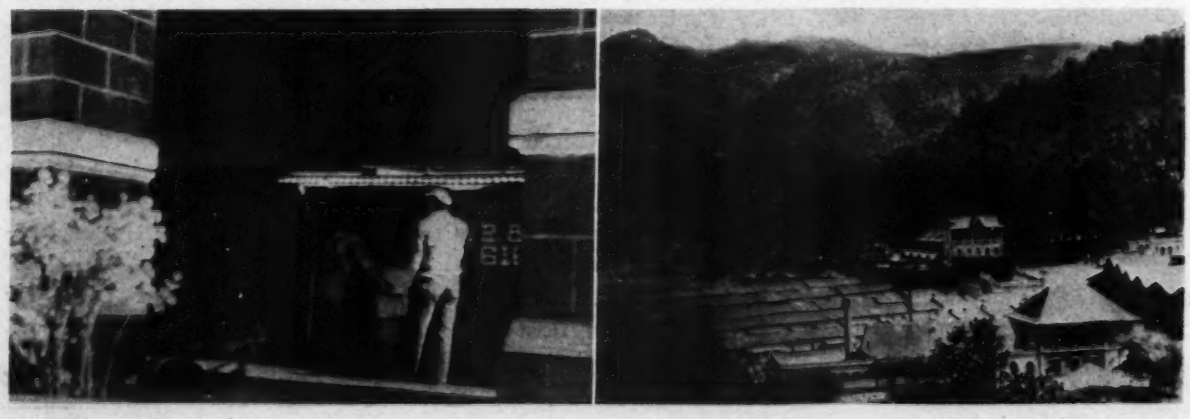
Further down the slope, the chippers deliver into a large concrete chip bin, from where the chips are fed to the two digesters, which produce approximately twenty-five tons per day.

A modified Mitscherlich pulp is produced. It is of good color and high quality, and is lapped or slushed as required. The unconventional part of this process again lies in the fact that from the delivery of the wood at the woodyard, and the sulphur and stone at the acid plant, the entire process is accomplished by gravity. The only pumps in the system are those necessary for returning white water or refined product back to a higher point in the system.

Waste paper is repulped in a series of kollergangs, and a series of concrete tube beaters are used for the preparation of rags. These two systems are necessary for the reason that the company produces nearly every type of paper, from roofing to boards, wrappings, printing papers, tissues, etc.

No sulphate plant is available, as the company has found it more economical to import this type of pulp from Europe when it is needed.

Left—Loading platform. Right—Employees' homes and hotel for bachelors.



Left—Digester house. Right—No. 8 Paper Machine.

In the paper mill are eight machines, ranging from an old machine built by Pusey & Jones and installed in the "Nineties," to a modern Number 8, built by Beloit Iron Works and 140 inches in width, or Number 7 built by Pusey & Jones and 154 inches wide. The two newest and largest machines have a combined output of approximately 100 tons of paper per day by making mostly book and cheap writing papers.

The other five machines produce roofings, boards, wrappings, poster, book, roto and tissues; and their combined output is in the vicinity of 100 tons per day. All machines are installed so that their rewinders are in line, and the product is sent directly to supercalenders (when necessary) which occupy the extreme end of the machine room.

Extending completely across the end of the machine room lies the finishing room, and the product moves directly into it from the machines or supercalenders. The finishing room is very large and roomy and is about 165 feet wide and 500 feet long. Included in the finishing room are machines for waxing, cutting, folding, pasting and wrapping. An unusual feature is the complete printing plant included in this department. Although originally designed only to handle the company's requirements for printing, a certain amount of material, especially bag stock, is imprinted with customers' advertising matter.

A large department is set aside for the manufacture of paper bags of all types and sizes up to the largest, and printing equipment is available for imprinting customers' advertising data on the bags while they are in process. This equipment is all of late design and is efficiently located and administered. In addition, a large new installation provides for the manufacture of imprinted cement sacks of the latest design.

Just beyond the finishing room, and opening directly into it, is a large warehouse and shipping room which opens directly onto appropriate covered railroad trackage accommodating ten cars. These cars, however, are small, only twenty-ton capacity, as the San Rafael & Atlixco Railroad is a narrow gauge road (3 foot gauge).

The plant laboratories are completely equipped from a chemical standpoint and include an extensive physical laboratory which is supplied with the latest equipment for testing of pulp and paper products. Close chemical control of all processes is maintained through this department and new processes and methods are being constantly derived and improved upon.

The engineering department occupies its own reinforced concrete building and is completely equipped with modern photostating and blueprinting equipment.

The power department is a branch of the engineering department and is in direct charge of the extensive canal system and the hydroelectric stations. Some idea of the extent of this branch can be gained from the fact that 11½ miles of canals, including several tunnels, 5 tanks with a total capacity of more than 2½ million gallons, more than 2½ miles of hydraulic power piping, 5,000 hp. of hydroelectric generators (6,600 volts 60 cycle), a high tension line 7 miles long, an extensive distributing station, 236 motors ranging from 1/16 to 1,000 hp., and a network of distribution cables some 16 miles long must be maintained and operated.

The steam department is also a branch of the engineering department and consists of two separate boiler plants. The old plant consists of 6 Martin-Babcock and Wilcox boilers, of 250 hp. capacity each, operating at 175 lb. pressure, and burning crude oil which is fed by gravity from an oil storage station of 3 tanks having a total capacity of 3 million gallons. The new boiler plant consists of two 1,000 hp. Babcock and Wilcox boilers operating at 650 lb. pressure. Both the power and boiler branches are equipped with the latest types of integrating and recording instruments, and a very close check on power and steam input to the various mills and departments is maintained.

The lubrication department branch of the engineering department is directly concerned with the types, kinds and qualities of lubricants required. It initiates studies of bearing and lubrication problems and is directly responsible for the functioning of the many transmissions in the plant.

The machine shop operates as a branch of the engineering department and is very completely equipped for the repair and reconstruction of almost any mechanical failure. The shop is very large and contains a variety of machine tools which is far more complete than is usually found in a paper mill machine shop, and, in fact, compares favorably with larger jobbing machine shops such as are to be found in this country. Probably the most unusual feature is the fact that there is a small foundry in connection with the machine shop, which is equipped to produce castings up to five or six tons in size.

The reason for this very complete and modern mechanical department lies in the fact that practically all of the machinery in the plant is imported from the United States or Europe and considerable difficulty would be experienced in obtaining delivery of repair parts within a reasonable length of time. A further evidence of the more or less isolated location of this plant is to be found in the store room. This is a very large, beautifully arranged room containing an inventory of over 36,000 different repair items. These items are neatly arranged in especially designed racks and bins which are separated by very wide aisles. Each

(*Concluded on page* 247.)

Simplified Curl Tester for Paper

F. T. CARSON[1] and VERNON WORTHINGTON[2]

▶▶▶ THE CURLING OF PAPER, which is frequently troublesome in printing and in other uses of paper, results from differential expansion of opposite surfaces brought about either by an unequal distribution of moisture following a change in the hygrometric state, or by an innate "two-sidedness" which causes the two surfaces of the paper to react differently toward the change, or perhaps to both circumstances in combination.

A rough measure of the tendency of a paper to curl, which is sufficiently good for many purposes, can be made in terms of the maximum angle through which the paper curls by means of the curl sizing tester (3) developed about 15 years ago in the Paper Section of the National Bureau of Standards. This measure seems to correlate fairly well with the probability that a paper will give trouble from curling under given conditions of use. Although the instrument was not originally designed for this purpose, and has certain definite limitations as a means of testing degree of curl, its use for this purpose by many paper technologists has followed probably from the simple manner in which the differential expansion is exaggerated by the wetting of one side of the specimen while the other is left dry. It is not an easy matter otherwise to expose the two surfaces to different conditions which will allow the paper to curl freely and reproducibly.

The angle at maximum curl which is read from a scale on the instrument is at present rather arbitrary, depending on a number of arbitrary factors such as the size and shape of the specimen, the manner of holding it, the width of the wetting aperture, the manner of wetting, and the position of the scale with reference to the wetting aperture. The test at present is therefore limited pretty much to comparison of relative values for a given grade of paper, and is valuable chiefly in such uses as mill control and specification testing of a given grade of paper intended for a specific purpose.

For testing of this type, when a suitably equipped curl sizing tester is not available, a fairly simple testing device that is quite adequate can be made, inasmuch as the timing and the synchronizing apparatus, which are used to determine the rate of curling in making a sizing test, are not required in measuring the degree of curl. Such an apparatus similar in essential features to the float in the sizing tester, was designed recently in connection with the development of a specification for tabulating cards, and may be of sufficient interest to justify describing its construction and use.

Work, however, is in progress to modify the test so as to make its application more general and more useful, to increase the precision of the measurement, and to eliminate as far as possible the objectionable features and arbitrary factors in the test.

The construction of the float is illustrated in Figure 1. A 5-inch square of thin sheet aluminum has its edges bent up to form a shallow pan about ⅜ inch high. In the bottom a rectangular hole is cut, with one corner located at the center of the float as shown. This aperture, the purpose of which is to admit water to a restricted area on one surface of the specimen, is about two inches long. The width is shown on the drawing as ⅞ inch, since this is the width of aperture found best suited to testing the tabulating-card stock. However, a material having a considerably greater tendency to curl, if tested with this aperture, might curl off the scale. The reading could be kept within the range of the scale by making the aperture narrower, although the results could not be compared with those obtained with the ⅞ inch aperture. A width of aperture best suited to the kind of material one wishes to test should be chosen. For all tests that are to be compared with one another, however, a constant aperture must be used, because the angle through which a paper curls will vary with the width of the aperture.

At the left-hand edge of the aper-

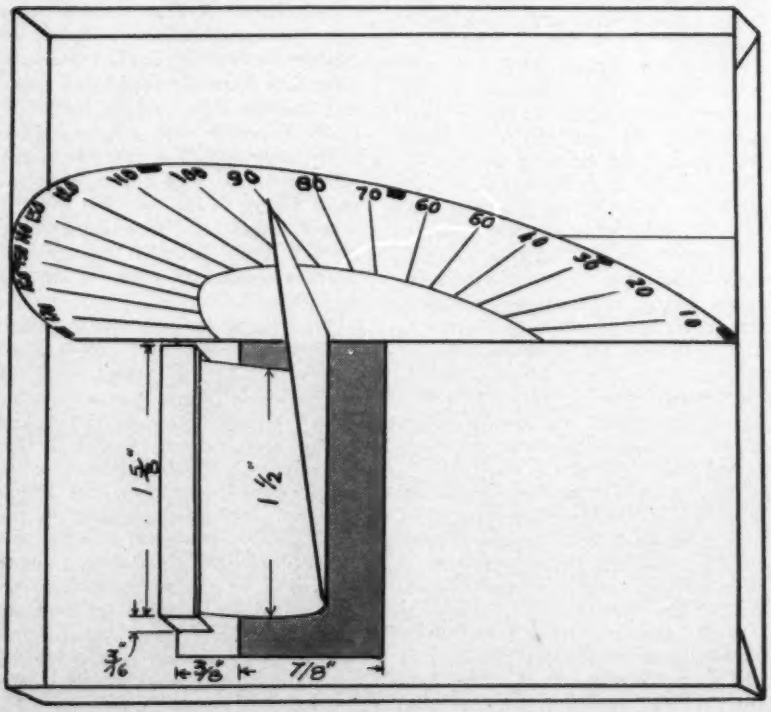


Fig. 1—Float for testing the degree of curl of paper.

(1) Technologist (Paper), U. S. National Bureau of Standards.

(2) Physical Science Aid, U. S. National Bureau of Standards.

(3) A new sizing tester for paper, *Paper Tr. J.* 79, TS142 (1924).

ture is a box-shaped holder, open on one side, the purpose of which is to restrain the movement of one end of the specimen inserted into it, allowing that end to curl through a fixed angle of 30 degrees, while the movement of the other end is being watched with reference to a scale. This holder is 1⅜ inches long, ⅜ inch wide, and 3/16 inch high. The end next to the scale is separated from it by about ⅛ inch to prevent the paper from striking the scale while curling. The holder can be shaped from the metal taken from the aperture, one side being left attached, and the piece being bent back on itself. If made of a separate piece, the holder can be fastened with tabs or small rivets, or it can be made to slide along crosswise of the aperture to provide for an adjustable width, in case one has occasion to require more than a single width of aperture.

Finally a coat of paraffin is applied to all surfaces and it should be made especially heavy around the edges of the aperture.

The appliance is floated on a pan of water, and can be restricted to vertical movement by wedging it between one side of the pan and some heavy, movable object such as a bottle or flask filled with water. The specimen, cut as shown in Figure 2, is held at an angle with the float while the square end is inserted in the holder. It is then allowed to fall across the aperture and become wet over the corresponding area. As the specimen curls upwards its square end is restrained by the holder at a fixed angle, while the dry, pointed portion moves along the scale. The maximum angle attained is taken as the relative value for degree of curl. Since the temperature of the water and the relative humidity of the atmosphere affect the results to a considerable extent, it is necessary to make the tests under controlled hygrometric conditions.

Typical values for the maximum angle of curl of several papers obtained with a wetting aperture of 7/8-inch.

Kind of Paper	Maximum Angle of Curl (Degrees)
Offset lithograph (soda)	20
Offset lithograph (sulphite and soda)	40
Offset lithograph (sulphite)	60
Tabulating card stock	90
Map paper	145
Bond (rag)	Greater than 180

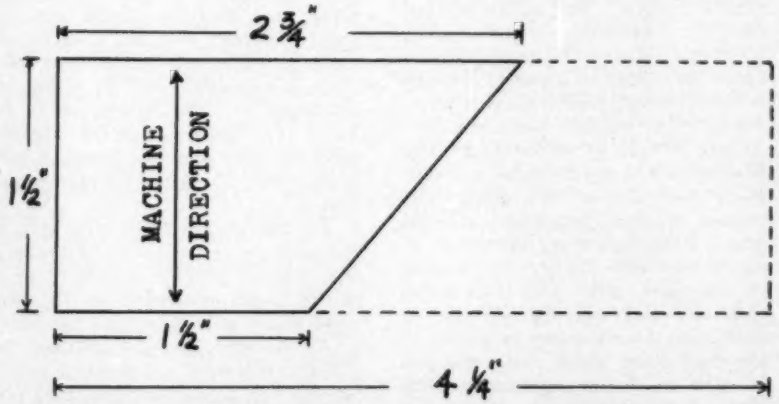


Fig. 2—Form and dimensions of the test specimen used in determining the degree of curl of paper.

The scale is placed on the center line of the float, and the graduations radiate toward that corner of the aperture which is situated at the center of the float, in conformity with the conventional design. The scale, which is laid off on paper in 10-degree intervals, is fastened by means of tabs to a thin, semicircular aluminum plate having a base formed by a right-angle bend which is riveted to the bottom of the float.

The accompanying table shows some typical curl data, obtained at 65 per cent relative humidity and 21 deg. C., to illustrate the range in curling tendency of various papers. The maximum angle of curl will, however, vary greatly with the beating and finishing treatment of a paper.

Mill in Mexico

(*Continued from page* 245.)

item is carefully marked and cross indexed to assure immediate availability.

Large and convenient offices are provided at the mill for the general superintendent, although the general offices of the company are located at 71 Avenida Uruguay in Mexico City.

The town of San Rafael was built by the company for its employees, and provides homes for its married personnel without charge. The bachelors are housed in a hotel which contains a restaurant, casino or lounge and a library. The company also provides a chapel, a casino, a billiard hall, a dance hall, a library and a sports field for its employees. In addition, a large amusement hall is provided. This hall is equipped for theatricals, movies, gymnastics and public assembly and has a capacity of more than 3,000.

The company also subsidizes an orchestra composed of fifty pieces, named La Orquestra Tipica de San Rafael, the members of which are all plant workmen. The cultural life of the community also has been furthered in the erection of schools, one for boys and another for girls. These schools have an attendance of more than 1,100 pupils. An evening school, provided for employees, is attended by more than 100 of the workers. A vocational school for older girls and women has been built where household arts, sewing, embroidery, etc., are taught. In this school much emphasis is laid on perpetuating the ancient embroidery designs once common in this area.

The company pays all teachers and provides all school supplies free of charge to residents of San Rafael, and at the graduation exercises, organizes a program where prizes are given for achievements in school work. In addition, each graduating pupil is presented with a suit of clothes or a dress, and more than 7,000 toys, imported from Europe, are presented to the younger children.

The San Rafael mill is one of the two principal manufacturing units of The San Rafael Paper Mills Company and Annexes. The other mill called El Progreso Industrial, is located at Villa Romero, District of Tlalnepantla, State of Mexico on the Monte Alto Railroad.

El Cia de las Fabricas de San Rafael y Anexas, S. A., (or The San Rafael Paper Mills Company and Annexes), had its origin in 1892 when Ahedo & Company founded the San Rafael mill which made it first delivery in May, 1892. Two years later, don Andres Ahedo and don Jose Sanchez Ramos dissolved Ahedo & Company, and in association with don Tomas Braniff, formed the present company.

Paraffin Waxes . . .

their Application to Papermaking

W. K. GRIESINGER and M. H. REYNOLDS
The Atlantic Refining Company

▸▸▸ ORDINARY PARAFFIN WAX as obtained from petroleum by the cold filter pressing of lubricating oil fractions is a mixture of high boiling crystalline hydrocarbons having melting points in the order of 115 deg. Fahr. to 140 deg. Fahr. Its chemical and physical properties vary with its manufacture, but generally speaking it is insoluble in water, soluble in oil, and chemically inert in the presence of acids, alkalies, and most other compounds used in paper manufacture.

In the paper industry paraffin wax finds two major applications: (1) as a sizing agent which is incorporated directly into the sheet as a beater or surface size during paper manufacture, and (2) as a coating and impregnating material which is applied to the finished sheet by the paper converter.

When employed as a sizing agent, wax, being insoluble in water, must be put into a form which will enable its easy dispersion in the water slurry of paper stock present in a beater.

For surface sizing where it is desired to put only a small quantity of wax, 1 per cent or less, on the sheet, a dispersion of wax in a solvent is also essential. Here water is not necessaary but due to its negligible cost, it is preferred to the exclusion of other possible wax solvents.

In dispersing wax in water the common method employed consists merely of adding to the wax an emulsifying agent which under proper mixing conditions will disperse the wax in water as small distinct globules having particle sizes of the order of 0.1 to 0.5 micron. For sizing purposes paraffin wax having a melting point of 124-130 deg. Fahr. is ordinarily used while emulsifying agents include montan wax, fatty acid soaps and petroleum soaps. Approximately one part emulsifier is used for every four to eight parts of wax. The emulsifying agent employed changes somewhat the properties of finished wax sized sheet, but in general its effects are of minor importance when compared with those of the wax.

When employed as a surface coating or impregnating medium, wax is usually used straight at a temperature above its melting point.

Beater Sizing with Wax

In the beater sizing of paper with wax the emulsified product preferably as an emulsion containing not more than 10 per cent wax, is added to the stock after it has been beaten to the desired freeness. Beating is continued for at least five minutes after the wax addition to insure uniform distribution of the wax, after which alum is added to flock the emulsion. As wax emulsions usually contain not more than 25 per cent of an emulsifying agent which is reactive with alum, it is normally necessary to add about 0.25 pounds of alum per pound of solid wax. This quantity of alum will of course vary with the type and amount of emulsifier used. The alum added does not react with the wax but by destroying the dispersing properties of the emulsifying agent, causes the wax particles to slowly agglomerate until they are of sufficient size to separate from the water. At this stage the paper fibres take up the wax in a manner similar to the take up of flocked rosin size.

Other sizing agents such as rosin, glue, starch, and the like, may and often are used along with wax size. They should be added separately to the beater and treated in the normal manner.

Both in the beater and on the wet end of a paper machine, wax has a tendency to increase the freeness of the stock and to cut down foaming.

With large quantities of wax, the driers must be operated at slightly slower rates. Best sizing values are obtained when the moisture in the sheet coming off the final roll is 6 per cent or less.

Due to the high surface finish obtainable with wax, slipping on the calender stacks sometimes occurs with large amounts of wax.

Physical Properties of Paper Beater Sized with Wax

The data given herein covering the physical properties of paper containing wax, were obtained almost entirely from laboratory tests on hand sheets made on a Standard British Sheet Machine in accordance with the procedure developed by Firth Dennett and C. E. Libby (1). Except where noted otherwise, the pulp used was bleached sulphite having a high alpha-cellulose content.

The tests used to evaluate the sample papers were performed in accordance with official TAPPI procedures in a testing room controlled at 75 deg. Fahr. and 70 per cent relative humidity.

All the wax data were obtained on Atlantic Waxemul, a commercial emulsifiable wax product containing 85 per cent wax plus a petroleum emulsifier. While strictly speaking these data are only applicable to Waxemul, they are, in general, applicable to all wax emulsions.

In Figure 1 the Cobb Size Value (2) for two minutes water contact is plotted against total size used. Straight wax is not plotted, since it does not give good sizing when used alone. Wax with small amounts of rosin, however,

(1) TAPPI Annual 1939, Pages 69-75.
(2) R. M. Cobb, Paper Trade Journal, No. 16, 42-45; April, 1935.

shows sizing values which are in all cases better than rosin alone. It is also interesting to note that rosin reaches a maximum sizing value at about 3.5 per cent total size whereas mixtures of wax and rosin level out at about 5.0 per cent total size. These data indicate that sizing results unobtainable with rosin alone can be secured with mixtures of wax and rosin.

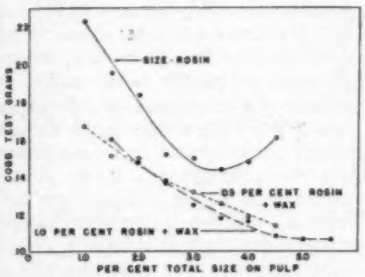


Fig. 1—Effect of wax on Cobb size values.

Figure 2 gives the Valley size results on the same sheets as above. In general, the Valley size tests closely follow the Cobb size results.

Figure 3 shows Valley size results for different pulps containing 2.0 per cent total size. In this series the percentage of wax used in the rosin-wax size was varied from 0 to 100 per cent in 20 per cent increments. As can be seen, all pulps are not equally susceptible to wax sizing.

Ground wood is particularly adaptable to wax. With 2.0 per cent total size, maximum sizing occurs with a mixture of 40 per cent rosin and 60 per cent wax. This maximum value is about 500 per cent greater than that obtained with straight rosin under the same conditions.

The penescope values given in Figure 4 were obtained with 20 per cent lactic acid at 75 deg. Fahr. Rosin gives maximum values at 3.0 per cent total size whereas rosin-wax mixtures reach higher values at about 4.0 per cent total size.

Figure 5 illustrates one of the main disadvantages in using wax in beater sizing. As can be seen, the more wax used in sizing, the poorer the Mullen bursting strength test. If a sheet sized with rosin alone is taken as standard, at 2.0 per cent total size a 50-50 mixture of wax and rosin shows about a 15 per cent decrease in bursting strength. It is possible to overcome part of this drop by running a slower stock or by increasing the beater temperature. Other materials such as starch are sometimes used along with wax in the beater to improve the Mullen test. In general, tensile strength tests parallel Mullen results.

The densometer results given in Figure 6 show that sheets containing wax are more porous to air than those containing only rosin. This property has suggested the use of wax in bag papers.

Data plotted in Figure 7 show that wax-rosin mixtures containing up to 30 per cent wax improve the tear test in most pulps from 10-20 per cent.

In addition to those physical properties illustrated by the foregoing graphs, wax also exerts certain influences on the physical properties of paper which can not be readily measured by laboratory devices. For instance, wax softens the sheet, making it more pliable and less harsh to the feel. It gives the surface a better finish for the same amount of calendering and at the same time lays the fuzz on lightly calendered papers.

The better surface obtained in wax sized papers is apparent in all papers which are to be printed. The smoother surface takes the ink easier with less strike through and better sharpness of detail for lower ink consumptions. For improving printing properties and softening the sheet, wax size of the order of 0.25-0.50 per cent is used.

Surface Sizing with Wax Emulsion

With the exception of the sizing efficiency values as measured by the Cobb and Valley Size Tests, many of the results that can be obtained by beater sizing can also be obtained but to a somewhat lesser extent, by surface sizing the finished sheet just before or during calendering.

In surface sizing a wax emulsion containing from 1.0 to 10.0 per cent wax is used. Other surface additives such as starch, casein, and dye are often mixed with the wax emulsion.

Surface sizing is satisfactory for improving the gloss and printing properties of the final sheet. Care must be taken, however, to have the sheet as

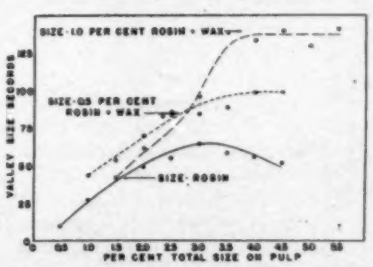


Fig. 2—Effect of wax on Valley size test.

near neutral as possible as a sheet containing excess alum may easily break the emulsion in the emulsion trough and cause wax spots in the final product.

Coating and Impregnating

Paraffin wax is employed as a coating and impregnating material for paper primarily because it affords a cheap and effective means for rendering the paper water repellant and moisture proof. Commercial methods for applying wax to paper can, in general, be classified as machine, immersion or spray waxing. Most versatile of these is machine waxing since, by altering machine adjustment or waxing conditions, the appearance and certain physical properties of the finished sheet can be varied within comparatively wide limits. How-

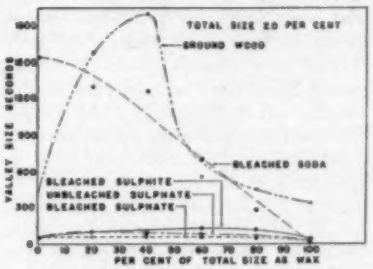


Fig. 3—Valley size results on common pulps.

ever, not all paper products can be machine waxed nor can all desirable effects be produced by that method.

Immersion waxing is carried out by dipping the paper into a bath of molten wax and then allowing excess wax to drain back into the bath. Products, such as liquid containers, which are formed prior to waxing, are usually coated by this method. It is also an excellent method for impregnating heavy board or laminated paper objects since the time of contact between the paper and the molten wax can be regulated to give the desired degree of saturation.

Spray waxing consists of atomizing the molten wax directly upon the surface of the material being coated. By this method, practically all of the wax is deposited on the surface of the paper or board. Spray waxing is particularly valuable for coating board because it minimizes the absorption of wax by the base material, thereby reducing the quantity of wax necessary to produce a surface coating of given depth. At the same time, discoloration of the board caused by wax saturation is prevented.

Machine waxing is a continuous process in which paper is waxed as it passes at high speed through a waxing machine. The usual waxing machine consists of a waxing section, where molten wax from a heated bath is applied to the paper, and a cooling section, where the wax on the paper is solidified and chilled sufficiently to prevent adhesion to adjacent waxed surfaces when the paper is rewound. This method of application is employed in the production of the bulk of the waxed paper made.

The wax bath usually consists of a metal tank heated by means of steam

coils and fitted with rolls situated so that the paper passes directly through the molten wax in the bath. Normal wax bath temperatures range from 150 deg. Fahr. to 220 deg. Fahr. In general, low temperatures are used for surface coating and high temperatures for impregnation.

The formation of odor-bearing and colored compounds in the wax after it is charged to the wax bath is one of the most persistent problems encountered in the paper waxing industry. These objectionable materials usually result from the chemical combination of the wax with oxygen from the air. In order to minimize this trouble the capacity of the bath should be no greater than is necessary, the temperature of the wax should be as low as is practicable and the metals in contact with the molten wax should be carefully selected. Most metals catalyze the oxidation of paraffin wax and in addition certain metals react with the oxidation products to form deep colored, wax soluble compounds.

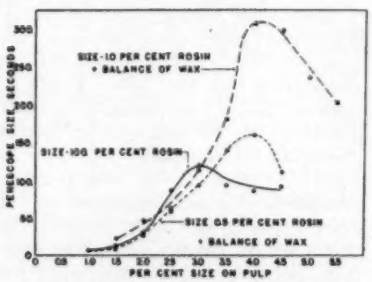

SIZE-10 PER CENT ROSIN + BALANCE OF WAX
SIZE-100 PER CENT ROSIN
SIZE 05 PER CENT ROSIN + BALANCE OF WAX
PENESCOPE SIZE, SECONDS
PER CENT SIZE ON PULP

Fig. 4—Effect of wax on lactic acid resistance.

The appearance and physical properties of any waxed paper will depend upon the paper, the wax and the method and conditions of waxing. If appearance is a consideration, an evenly matted, clean paper should be selected because spots and blemishes in paper show up much clearer after waxing than before.

In producing a waxed paper for any proposed application, it is first necessary to determine the properties desired and then to select materials and establish waxing conditions which will give a waxed sheet possessing, as nearly as possible, those characteristics. Some of the more important properties of waxed papers are discussed below.

Water Repellency

The term water repellency refers to the ability of waxed paper, in direct contact with aqueous liquids, to resist the penetration of water either into or through the paper. The water repellency of a waxed paper depends principally upon the quantity and distribution of the wax load. Wax saturated paper is usually only moderately water repellent; heavily coated paper is highly water repellent; and paper which is both saturated and coated is more water repellent than either of the above. The chief advantage of the latter type of paper over that carrying the total wax load on its surface is that the wax to wax bond unlike the wax

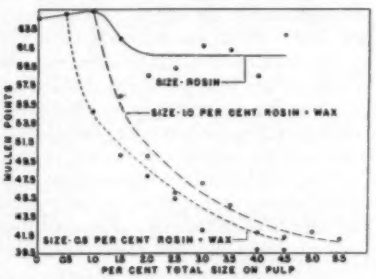


Fig. 5—Effect of wax on bursting strength.

to paper bond, is strong enough to resist loosening of the coating due to the swelling of the paper when it becomes saturated with water.

If maximum water repellency is desired, highly calendered paper should be used and the time of contact between the paper and the molten wax should be prolonged sufficiently to permit saturation in addition to coating. Highly calendered paper is recommended because it is usually less absorbent than paper which has not been calendered and, in addition, fibers projecting from the surfaces of soft papers reduce the effective thickness of the wax coating.

Moisture Resistance

The tendency for a waxed paper to retard the migration of moisture from a humid atmosphere on one side to a

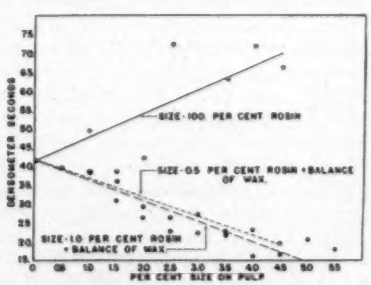

SIZE-100 PER CENT ROSIN
SIZE-05 PER CENT ROSIN + BALANCE OF WAX
SIZE-10 PER CENT ROSIN + BALANCE OF WAX
DENSOMETER SECONDS
PER CENT SIZE ON PULP

Fig. 6—Effect of wax on porosity.

less humid atmosphere on the other is termed moisture resistance. In general, water repellent papers are also moisture proof. However, since there is no tendency for paper exposed to a humid atmosphere to swell, wax saturation of the sheet is not necessary and, therefore, high machine speeds and low wax bath temperatures are possible. Here again, smooth surfaced papers are preferable to soft, absorbent papers. Soft papers can be made both water repellent and moisture proof by the application of wax but, in order to obtain the same degree of water repellency and moisture resistance, they require considerably heavier wax loads than hard papers of the same weight.

Transparency

Waxed paper will transmit a greater proportion of the incident light than will the unwaxed paper from which it was made. Because of this, the application of paraffin wax usually increases the transparency of paper. Nearly any light weight paper is sufficiently transparent after waxing to permit the reading thru it of printed matter with which it is in direct contact but usually the printing is obscured if the waxed paper is moved even a short distance away from the surface of the printed sheet. However, highly transparent paper can be made by properly waxing suitable paper.

In order to obtain maximum transparency with any paper it should be

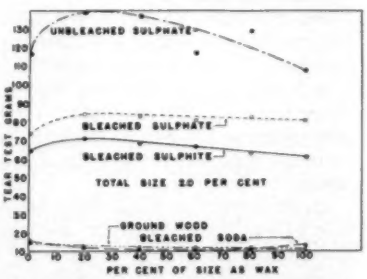


Fig. 7—Effect of wax on tearing strength.

waxed so that it carries a light surface coating over a completely wax saturated sheet. The best method for the production of such paper consists in first saturating the sheet by applying wax at a relatively high temperature and passing the waxed paper between squeeze rolls under tension, followed by coating in the regular manner from a wax bath at 150 to 170 deg. Fahr. However, almost as good results can be obtained in a single operation by applying wax at 170 to 190 deg. Fahr. and allowing sufficient time of contact between the paper and the molten wax to insure a high degree of saturation.

Glassine type papers should be used if a very transparent sheet is desired. However, it is not necessary that the paper be highly transparent before waxing. In fact, high grade glassines are often difficult to wax because of poor adhesion.

Gloss

In order that a waxed paper exhibit a high gloss or sheen, it must have a smooth, continuous wax coating over

its surface. If this condition is met, the gloss will depend upon the speed of solidification of the wax. In general, the faster the wax is solidified the glossier will be the surface of the coating.

To produce the greatest gloss, the lowest practicable wax bath temperature should be employed and the speed of the machine should be such that the temperature of the coating is only a few degrees above the solidification temperature of the wax when the coated paper enters the cooling section of the machine. However, if the wax is allowed to solidify before reaching the cooling sections, the gloss will suffer.

The cooling section of a waxing machine usually consists of either chilled rolls over which the paper passes, or a tank of brine cooled water through which the paper is drawn. The latter method is preferable for the production of glossy paper.

Sealing Strength

Often, when products are wrapped in waxed paper, heat is applied to sections of the paper where the edges overlap, in order to fuse the adjacent wax surfaces and thus effect an air tight moisture proof seal. The wax to wax bond must necessarily be strong enough to withstand ordinary handling. For this reason the sealing strength of the paper is frequently an important consideration in the production of waxed wrapper.

Since the bond between waxed paper surfaces can be no stronger than the wax in the coating, the most important single factor in the production of high sealing strength paper is the wax itself. A wax for this purpose should have a high tensile strength (usually determined at 70 or 75 deg. Fahr.) and should retain much of its strength at temperatures encountered during the summer months. Waxes melting lower than the 128-130 deg. Fahr. A.M.P. commercial grade are not suitable for coating paper that is to be heat sealed, because of excessive softening at summer temperatures. However, since there is no direct or constant relationship between the melting point and the strength of paraffin wax, it is often advisable to specify tensile strength in addition to melting point.

A paper for sealing purposes must be surface coated and in addition it should be saturated to a reasonable extent to insure a strong wax-to-paper bond and to prevent absorption of the wax by the paper when heat is applied.

Specific Gravity—Temperature Relationships for Rosin Size Milk

H. N. BOGART[1] and D. S. DAVIS[2]

Wayne University

▸▸▸ THE DETERMINATION OF solids in rosin size milk has an important place in any program of technical control. It is usually effected by sampling the milk at the beaters or in a storage tank, evaporating a small quantity and drying the residue at 105 deg. C. Several hours necessarily elapse before a concentration value can be reported so that two or three beaters may be dropped with only an approximately correct charge of rosin.

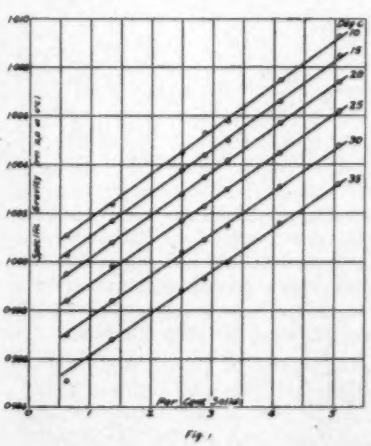


Fig. 1

There is evident need for a rapid and reasonably accurate method for estimation of solids in rosin size milk. Hydrometric means immediately suggest themselves since, in a given mill, rosin is either cooked by a standard procedure or prepared rosin size is in use. It is the purpose of this paper to present (1) specific gravity data for rosin size milks testing 0.6 to 5.1 per cent solids at temperatures between 10 and 35 deg. C., and (2) a line-coordinate chart enabling convenient calculation of percentage solids when specific gravity and temperature are known.

Experimental Method

A master milk containing 10 per cent solids was prepared by diluting heavy, commercially available rosin size with water, after which six weaker milks were made from the master milk by further dilution. The solids content of each was determined in duplicate by evaporation and drying at 105 deg. C., and a portion of each milk, in turn,

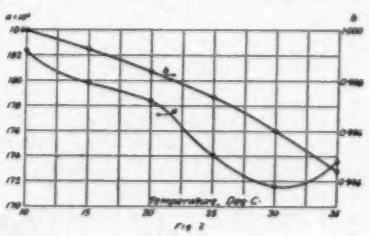


Fig. 2

Table I

Per Cent Solids	Specific Gravities (relative to water at 4 deg. C.) at					
	10° C.	15° C.	20° C.	25° C.	30° C.	35° C.
0.617	1.0011	1.0003	0.9995	0.9984	0.9970	0.9952
1.360	1.0025	1.0017	1.0009	0.9998	0.9984	0.9968
2.501	1.0045	1.0038	1.0028	1.0017	1.0004	0.9988
2.869	1.0053	1.0044	1.0035	1.0023	1.0009	0.9993
3.250	1.0058	1.0050	1.0042	1.0030	1.0015	1.0000
4.110	1.0075	1.0066	1.0057	1.0045	1.0031	1.0016
5.073	1.0093	1.0085	1.0074	1.0062	1.0048	1.0032

(1) Graduate student; (2) Chemical Engineering Department.

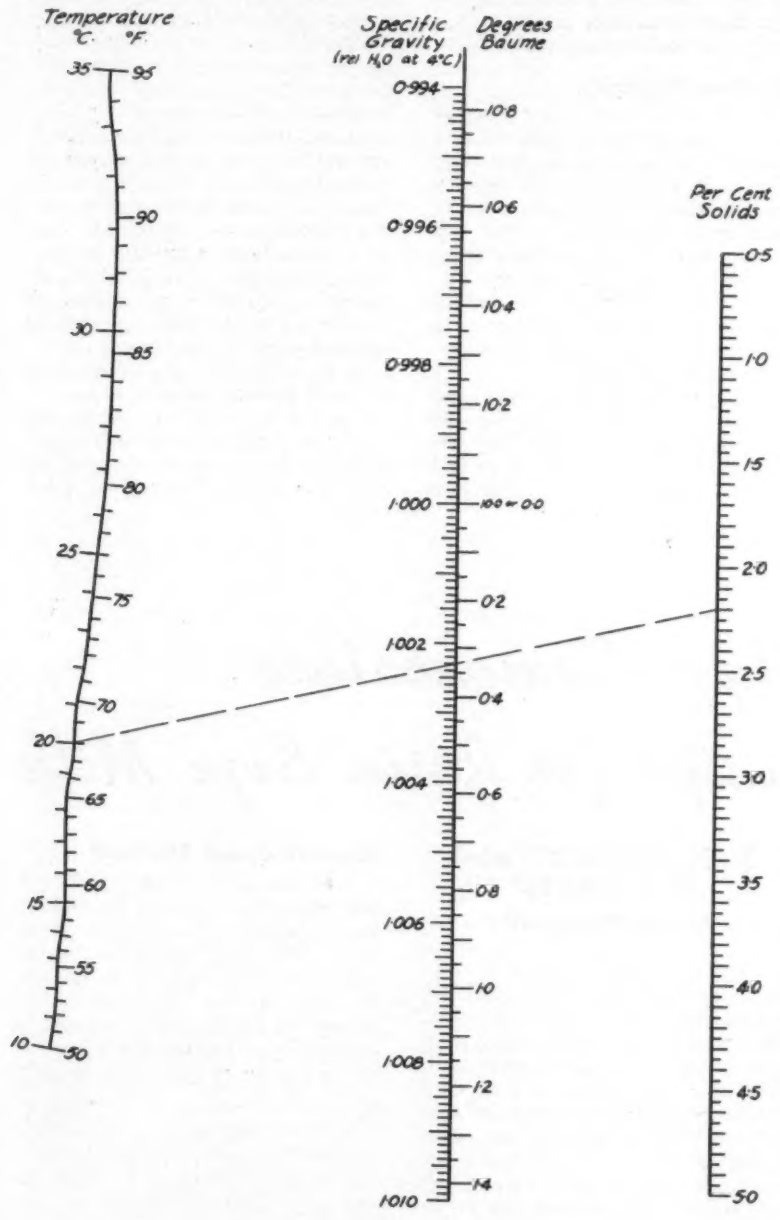


Fig. 3

was placed in a standardized pycnometer of about 30 ml. capacity, equipped with a combination ground-glass stopper and thermometer. The pycnometer and contents were cooled below 10 deg. C., and allowed to warm slowly to 35 deg. C. Weighings were made at 5-degree intervals and specific gravities relative to water at 4 deg. C., were calculated.

The data are presented in Table I, while Figure 1 shows the specific gravity—concentration isotherms to be straight lines.

Correlation of Data

For each milk the linear relationship between specific gravity, δ, and percentage solids, C, can be written as

$$\delta = a\,C + b$$

where *a* and *b* vary with the Centigrade temperature, *t*, as shown in Figure 2. A smooth curve through the points enables values of *b* to be read for temperatures other than 10, 15, 20, 25, 30, and 35 deg. C. In the case of a, values for 12.5, 17.5, 22.5, 28, and 32 deg. C., were calculated by means of the La Grange interpolation formula (*Chem. & Met., 45,* No. 7, 383, 1938) enabling a reliable and reproducible curve to be drawn through the points.

Use of the Nomograph

Figure 3, a line-co-ordinate chart based upon the above relationships permits rapid and sufficiently accurate calculation of the percentage solids content when the specific gravity and temperature of the milk are determined. The broken line on the chart indicates that a rosin size milk at 20 deg. C., showing a specific gravity of 1.0023 (relative to water at 4 deg. C.) contains 2.20 per cent solids. For convenience, the temperature axis bears both Fahrenheit and Centigrade scales while the central axis carries a specific gravity scale and a Baumé scale. In connection with the latter, the relationship for liquids heavier than water is $\delta = 145 / (145 - Bé)$ while for liquids lighter than water it is $\delta = 140 / (130 + Bé)$.

Table 2 shows the nature of the agreement between calculated and experimental values, indicating that the chart yields percentage solids values deviating, on the average, by about 1.4 per cent from the observed data.

In the case of a rosin size differing widely from that used in this investigation the user of the nomograph may find it advisable to apply a correction factor. Such a factor can be determined by comparing several observed values with values read from the chart.

Table 2

t °C.	δ	Per Cent Solids		Per Cent dev.	t °C.	δ	Per Cent Solids		Per Cent dev.
		chart	known				chart	known	
10	1.0011	0.613	0.617	—0.6	10	1.0024	1.324	1.360	—2.6
20	0.9995	0.623	0.617	1.0	20	1.0008	1.361	1.360	0.1
30	0.9970	0.563	0.617	—8.8	30	0.9984	1.375	1.360	1.1
10	1.0045	2.477	2.501	—1.0	10	1.0053	2.920	2.869	1.8
20	1.0028	2.484	2.501	—0.7	20	1.0035	2.873	2.869	0.1
30	1.0004	2.542	2.501	1.6	30	1.0009	2.842	2.869	—0.9
10	1.0058	3.195	3.250	—1.7	10	1.0075	4.125	4.110	0.4
20	1.0042	3.270	3.250	0.6	20	1.0057	4.110	4.110	0.0
30	1.0015	3.188	3.250	—1.9	30	1.0031	4.120	4.110	0.2

Chemical and Physico-Chemical
Relationships of Pulps

S. I. ARONOVSKY and E. C. DRYDEN,
Agricultural By-Products Laboratory*

▸▸▸ IN THE COURSE OF THE RESEARCH WORK carried out in the Agricultural By-Products Laboratory on the utilization of cellulosic farm waste materials for the production of pulps for paper and cellulose derivatives, it appeared desirable to obtain, if possible, more rapid means of evaluating these pulps. Many of the analytical methods used to determine pulp characteristics are too slow to be of value in following the effects of the various steps in the preparation of pulps. Considerable saving of time could be effected if certain of the pulp constants could be evaluated in terms of those other constants whose determination is simpler and less time-consuming. Such a procedure would necessarily presuppose the existence of definite relationships among the various analytical values of cellulose pulps.

Certain relationships already have been observed generally, such as those between the alkali solubility and hemicellulose content and between the permanganate number and lignin content of some pulps. In order to determine whether or not such general correlations could be established among the other analytical values, it was decided to examine a large number of representative pulps made by the various commercial processes. This report deals with the analyses of forty-seven samples of pulp and cotton, and with the attempt to correlate the analytical data obtained.

The pulps, analyses of which are given in this report, were commercial pulps, obtained from all pulp-producing sections of continental United States and from Cuba and the Hawaiian Islands, and produced from various woods and from sugar-cane bagasse. The wood pulps consisted of various grades of bleached and unbleached sulphite, soda, kraft, and sodium sulphite pulps, while the bleached and unbleached bagasse pulps were produced by the nitric acid pulping process. Samples of untreated cotton and of bleached and unbleached cotton linters were also used. (Unfortunately, the detailed history of the individual samples was not available in all cases.)

The air-dry pulps were prepared for analysis by grinding in a Wiley- type mill to pass a sieve with 1-mm. openings, and the ground pulps were stored in sealed Mason jars. The samples were then analyzed for moisture, ash, ether-extractives, lignin *(6)*, pentosans *(1)*, Cross and Bevan cellulose *(2)*, alpha-cellulose *(2)*, solubility in 7.14 per cent sodium hydroxide *(5)*, permanganate number *(4)*, copper number *(8)*, and cuprammonium viscosity *(7)*. The results of these analyses are given in Tables 1, 2 and 3 and are shown graphically in Figures 1, 2 and 3. The values given are the mean of two or more individual determinations. Since cuprammonium viscosity is one of the more important characteristics of pulps, the data were tabulated and plotted graphically in the order of increasing viscosity.

Cottons

The data on cotton and cotton linters are given in Table 1. The alpha-cellulose content of these cottons was fairly high, as expected, and the viscosity increased with the increase in

(*) Established by the Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, in co-operation with the Iowa State College, Ames, Iowa.

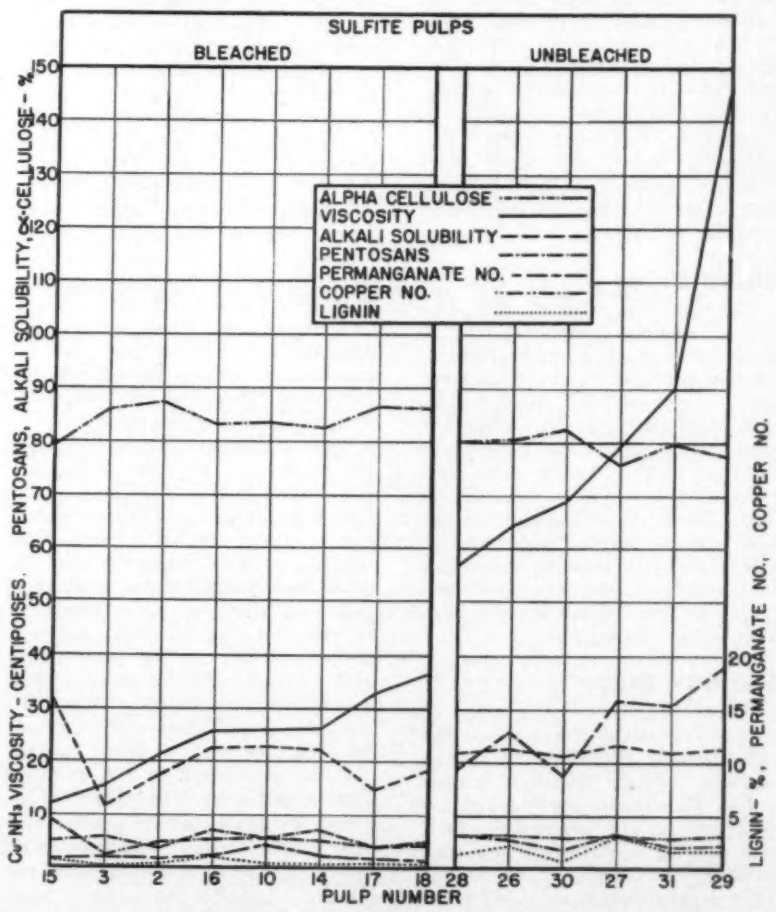


Fig. 1—Comparison of physical and chemical constants of commercial bleached and unbleached sulphite pulps.

Table 1—Analyses of Cotton Linters, Lint Cotton, and Alpha Pulps.*

Pulp number	Form	Type of Material	Moisture (per cent)	Ash (per cent)	Ether-extractives (per cent)	Lignin[1] (per cent)	Pentosans (per cent)	Alpha-cellulose (per cent)	Alkali solubility (per cent)	Permanganate number	Copper number	Viscosity 1-per cent soln. (centipoise)	Viscosity 0.5-per cent soln. (centipoise)
38	Linters	Average quality, low viscosity, bleached	2.7	0.02	0.04	trace	1.4	94.8	3.8	0.8	0.46	10.2	....
36	Linters	High quality, medium viscosity, bleached	2.8	0.02	0.00	trace	1.2	98.1	3.4	0.8	0.32	61.8	....
39	Lint	Untreated	2.1	0.73	0.63	0.32	1.7	96.0	6.0	2.1	0.27	432.	46.4
37	Linters	High viscosity, unbleached	2.8	0.04	0.33	0.58	1.4	98.6	2.2	2.5	0.27	573.	44.6
5	Alpha pulp from wood		5.4	0.10	0.27	trace	1.5	92.7	4.6	0.9	0.47	6.6	....
6	Alpha pulp from wood		3.9	0.12	0.34	0.1	4.0	92.9	6.7	0.7	0.61	27.0	....
1	Alpha pulp from wood		4.6	0.12	0.31	trace	2.2	95.6	5.9	0.9	0.14	28.7	....
4	Alpha pulp from wood		3.7	0.11	0.28	0.2	4.0	92.5	7.2	0.6	0.54	35.1	....

(*) All values, except moisture, are based on the oven-dry pulp. (1) Uncorrected for ash in lignin.

alpha-cellulose for both the bleached and unbleached materials. The alkali solubility of the cottons decreased with increasing viscosity and alpha-cellulose content. The bleached linters had somewhat higher copper numbers than the unbleached, while the permanganate numbers were higher for the unbleached linters, increasing with the lignin content (material insoluble in 72-per cent sulphuric acid). The pentosan content, ash, and ether-extractive figures for these cottons showed no particular correlation with the other values.

Alpha Pulps

The pulps designated as alpha pulps were all obtained from wood, and the analytical data are given in Table 1. Samples 4, 5, and 6 had similar alpha-cellulose contents, but the viscosities were quite divergent. Excluding sample 1, it may be seen that the viscosity increased with increasing alkali solubility and pentosan content of the pulp. There was no apparent correlation between copper number and alkali solubility or between permanganate number and lignin content of these pulps, but these values were all fairly low for the refined pulps.

Sulphite Pulps

There appeared to be a limited degree of correlation between the alpha-cellulose content and cuprammonium viscosity of the bleached sulphite pulps. The data are shown graphically in Figure 1. The remarkable correlation between the viscosity and alkali solubility for pulps 3, 2, 16, 10, and 14 was probably due to coincidence since, in general, the pulps with lower alkali solubilities tend to have the higher viscosities. The relationship between alkali solubility and pentosan content of the sulphite pulps was not uniform. This is probably due to the fact that the pentosans and other hemicelluloses of the different woods used in the manufacture of these pulps vary in composition and in their mode of attachment to the cellulose molecules. The alkali solubility increased, in general, with increasing copper number of these pulps. There was no definite relationship between the permanganate number and lignin content of the bleached pulps. It must be noted here that, since the lignin contents of bleached or refined pulps are relatively low, no very close correlation between the lignin content and permanganate number may be expected, due mainly to the inherent experimental errors of the empirical analytical methods employed.

The cuprammonium viscosities of the unbleached sulphite pulps were considerably higher than those of the bleached samples, as indicated in Figure 1. There was no apparent relationship between viscosity and the other characteristics of the unbleached pulps, but there was good correlation between the alkali solubility and pentosans and between the latter values and the alpha-cellulose content. The copper numbers followed the alkali solubility values fairly well, and both of these values were fairly constant for the unbleached pulps. A much better correlation was obtained between the permanganate number and lignin content of these unbleached pulps than was the case with the bleached samples. Even here, however, the permanganate number was not directly proportional to the lignin content, indicating that the permanganate number is probably affected by some of the other pulp constituents *(3)*. The apparent correlation between the lignin and pentosan contents of these pulps was fairly good.

Soda Pulps

The viscosity of the bleached soda pulps increased with increasing alpha-cellulose content but this relationship was not proportional. The alkali solubility, on the other hand, decreased regularly with the increase in alpha-cellulose content. The correlation between the pentosan content and alkali solubility of pulps 9, 12, and 11 was excellent, as shown in Figure 2. The copper number decreased, in general, with increasing viscosity and decreasing alkali solubility. There was also a small degree of correlation between the lignin content and permanganate number of these pulps.

As in the case of unbleached sulphite, the viscosity of the unbleached soda pulps bore no apparent relation to the other pulp values. There was good correlation between alkali solubility and pentosan content of these pulps, as well as between the lignin content and permanganate number. The alpha-cellulose content showed fairly good correlation with the alkali solubility and with the pentosan content, the latter two values decreasing with increase in alpha-cellulose. The copper numbers of these pulps were fairly low, as shown in Figure 2.

Kraft Pulps

Since only two samples of bleached kraft pulp were available for analysis, it is difficult to draw any generalizations regarding their physical and

chemical characteristics. However, as with the other pulps, the pentosans and alkali solubility increased with decreasing alpha-cellulose, as indicated in Table 2.

The viscosity of the unbleached kraft pulps bore no apparent relation to the other pulp characteristics, as shown in Table 2. There was good correlation between the alkali solubility and pentosan content, and between the latter two values and the alpha-cellulose content, as well as between the lignin content and permanganate number.

Sodium Sulphite Pulps

Only one sample each of bleached and unbleached sodium sulphite pulps was available, and the analyses of these samples are given with the kraft pulps in Table 2.

Nitric Acid Pulps

These pulps were all produced from sugar-cane bagasse, and the analytical results are shown in Figure 3. It may be seen from the analyses that these pulps, with one or two exceptions, belong in the alpha pulp classification. There was fairly good correlation between the viscosity and the alpha-cellulose content. The alkali solubility and pentosan content also showed a close relationship, and these two constants decreased regularly with increasing alpha-cellulose. The permanganate number, lignin content, and copper number of these pulps were relatively low and generally fairly uniform.

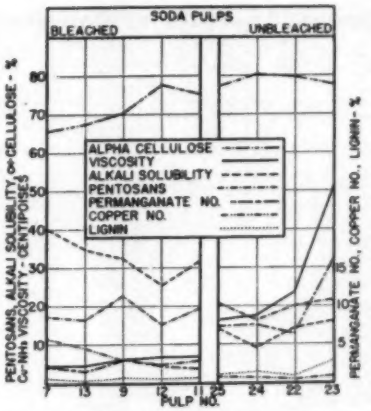


Fig. 2—Comparison of physical and chemical constants of commercial bleached and unbleached soda pulps.

Since only two samples of the unbleached nitric acid bagasse pulps were available, it is difficult to draw definite conclusions. However, the viscosity of these pulps apparently increased with increasing alkali solubility and pentosan content and with decreasing alpha-cellulose. The permanganate number increased with increasing lignin content, while the copper number, ash, and ether-extractives showed no apparent correlation with the other values.

COMPARISON OF VARIOUS TYPES OF PULPS

The analytical results for each different type of pulp were averaged and the mean values are given in Table 3. Some interesting inferences of a general nature may be drawn from these data. For example, in the case of soda pulp, the alpha-cellulose content of the bleached pulp is apparently lower than that of the unbleached pulp, and the bleached pulp has a greater solubility in 7.14-per cent sodium hydroxide. This indicates that the cellulose in the soda pulp may be degraded to a relatively large extent during the bleaching process. It also may be noted that while bleaching results in a reduction of the alkali solubility of nitric acid and sulphite (acid) pulps, the reverse is apparently true for the alkaline pulps produced by the soda and graft processes.

The average values for the cuprammonium viscosity of the alpha pulps and bleached sulphite pulps are remarkably similar. Since the alpha pulps were produced from sulphite pulp, this correlation indicates the possibility that the refining of sulphite wood pulp to increase its alpha-cellulose content might have but little effect on the final viscosity of the pulp.

The data in Table 3 indicate that bleaching causes a reduction in ash and lignin contents, permanganate number, and cuprammonium viscosity; the bleached pulp usually has a higher alpha-cellulose content and copper number than the unbleached pulp. The pentosan content of the pulp seems to be but slightly affected by bleaching, except in the case of the nitric acid bagasse pulps.

Table 2—Analyses of Commercial Kraft and Sodium Sulphite Pulps.*

Pulp number	Raw material	Moisture (per cent)	Ash (per cent)	Ether-extractives (per cent)	Lignin[1] (per cent)	Pentosans (per cent)	Cross & Bevan cellulose (per cent)	Alpha-cellulose (per cent)	Alkali solubility (per cent)	Permanganate number	Copper number	Viscosity (centipoise)
BLEACHED KRAFT PULPS												
20	.....	4.3	0.43	0.26	trace	11.1	....	83.8	20.7	1.8	2.27	11.7
19	Jack pine...	4.4	0.90	0.22	0.1	11.5	....	81.8	22.3	3.0	2.44	17.4
UNBLEACHED KRAFT PULPS												
33	.....	3.6	0.76	0.46	2.8	11.1	93.5	78.5	9.9	16.2	0.85	39.7
35	Jack pine...	3.9	0.58	0.42	3.6	11.6	94.2	78.3	10.6	18.6	1.09	49.2
34[a]	Jack pine...	3.9	0.86	0.43	4.6	11.6	93.6	76.3	10.9	22.1	1.25	61.4
32[b]	Hemlock white fir.	4.1	0.84	0.32	5.7	8.6	93.1	77.6	9.0	26.3	1.27	78.2
BLEACHED SODIUM SULPHITE PULP												
8	Jack pine...	4.2	1.98	0.04	1.2	11.3	....	79.2	24.1	1.7	1.87	6.9
UNBLEACHED SODIUM SULPHITE PULP												
21	Jack pine...	4.4	0.59	0.10	0.1	11.8	96.7	77.4	16.3	2.2	0.90	9.6

(*) All values, except moisture, are based on oven-dry pulp. (a) Strong pulp. (b) Regular pulp. (1) Uncorrected for ash in lignin.

Table 3—Average Analyses of Commercial Pulps.*

Type of Pulp	Ash (per cent)	Ether-extractives (per cent)	Lignin[1] (per cent)	Pentosans (per cent)	Cross & Bevan cellulose (per cent)	Alpha-cellulose (per cent)	Alkali solubility (per cent)	Permanganate number	Copper number	Viscosity (centipoise)
Alpha	0.1	0.3	0.1	2.9	....	93.4	6.1	0.8	0.4	24.4
Bleached sulphite	0.3	0.4	0.5	5.4	....	84.4	20.2	1.1	2.6	24.4
Unbleached sulphite	0.4	0.4	1.9	5.1	94.7	79.3	22.2	13.6	3.1	84.2
Bleached soda	0.7	0.5	0.5	18.3	....	71.1	33.0	2.1	3.7	5.6
Unbleached soda	1.1	0.2	1.6	19.7	95.6	78.7	13.4	9.5	0.7	27.1
Bleached kraft	0.7	0.2	0.1	11.3	....	82.8	21.5	2.4	2.4	14.6
Unbleached kraft	0.8	0.4	4.2	10.7	93.6	77.7	10.1	20.8	1.1	57.1
Bleached nitric bagasse	0.3	0.4	0.2	7.2	....	92.6	8.35	1.7	0.5	22.9
Unbleached nitric bagasse	0.7	0.4	1.2	13.9	96.6	83.5	21.7	7.3	0.9	32.2

(*) All values are based on oven-dry pulp. (1) Uncorrected for ash in lignin.

CONCLUSIONS

It may be concluded from the above data that there is some correlation between the various analytical values and, although this relationship is closer for bleached than for unbleached pulp, it is neither regular or uniform. It is apparent that no one of the usual characteristics determined on a pulp can be used as an accurate measure of any other.

It must be pointed out, however, that the commercial pulps used in this work were obtained at random, without regard to the type of wood or degree of digestion and refinement. It is quite possible that, as suggested by the results obtained on bleached nitric acid bagasse pulps, greater uniformity in raw material and in the degree of pulping and refinement might result in better correlation of the pulp characteristics.

The obtained data confirm some of the known relationships between these characteristics. The alkali solubility varies, as a rule, with the pentosan content, and also to some extent with the copper number; the permanganate number follows the general trend of the lignin content, especially in the case of unbleached pulp; the viscosity of unbleached pulp is considerably higher than that of bleached pulp of the same type; the alpha-cellulose content varies inversely with the alkali solubility of the pulp; and the ash content and ether-extractive values bear practically no relationship to the other characteristics.

Soda pulp is degraded to a larger extent, in bleaching, than the sulphite, kraft, or nitric acid pulps. The general effects of bleaching are different for the various types of pulps, as indicated by the average of the analytical values obtained.

SUMMARY

1) A number of commercial alpha pulps, bleached and unbleached sulphite, kraft, soda, sodium sulphite, and nitric acid pulps, and cotton lint and linters were analyzed for moisture, ash, ether-extractives, lignin, pentosans, alpha-cellulose, alkali solubility, permanganate number, copper number, and cuprammonium viscosity.

2) From the data obtained it appears that there is no regular definite correlation between these values, and that no one analytical characteristic can be depended upon to serve as an accurate measure of any other characteristics.

3) The effect of bleaching on the analytical pulp values depends to some extent on the type of pulp.

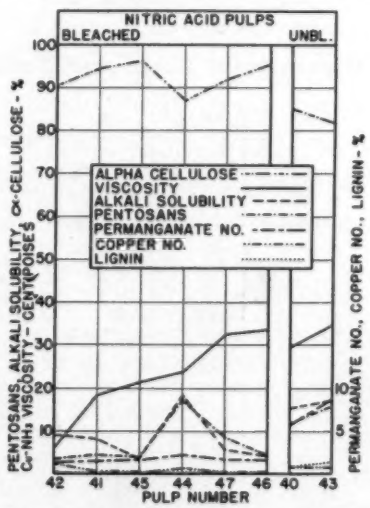


Fig. 3—Comparison of physical and chemical properties of commercial bleached and unbleached nitric acid bagasse pulps.

ACKNOWLEDGMENT — The authors acknowledge the valuable assistance of T. F. Clark and C. R. Faulkender of the Agricultural By-Products Laboratory in obtaining and organizing the above data.

Literature Cited

1) *Assoc. Official Agr. Chem., Methods of Analysis,* 4th ed., Method 36, p. 344 (1935).
2) Bray, M. W., *Paper Trade J.* 87, No. 25, 59 (1938).
3) Edwards, P. B. and Mackney, A. W., *J. Council Sci. Ind. Research,* 11, 185-200 (1938).
4) Institute of Paper Chem., Appleton, Wisconsin, Standard Method No. 410.
5) Lynch, D. F. J., *Ind. Eng. Chem.* 22, 952 (1930).
6) Ritter, G. J., Seborg, R. M., and Mitchell, R. L. *Ind. Eng. Chem.,* Anal. Ed., 4, 202 (1932).
7) TAPPI Standards, Method T-206-m-37 (Dec. 15, 1937).
8) TAPPI Standards, Method T-430-m-38 (Jan. 1938).

PAPER SKETCHES

A PRODUCT OF AMERICA'S ORIGINAL RITTENHOUSE MILL WAS GIVEN A BOOST IN ENGLAND IN 1698. A LONDON PAPER REPORTED: "ALL SORTS OF GOOD PAPER ARE MADE IN GERMAN-TOWN."
A COPY OF TENNYSON'S "MORTE D'ARTHUR," DATED 1842 WAS PROVEN FRAUDULENT BY ANALYSIS OF THE PAPER. THE PAPER WAS FOUND TO CONTAIN ESPARTO AND CHEMICAL WOOD—SUBSTANCES WHICH CAME INTO USE AT A LATER DATE!
DURING THE REVOLUTIONARY WAR THE COMMANDING OFFICER OF COLONIAL FORCES OCCUPYING PHILADELPHIA HAD TO ISSUE A PROCLAMATION DEMANDING THAT PAPER BE PRODUCED BEFORE HE COULD GET EVEN A FEW POUNDS OF THE PRECIOUS STUFF.
PRELIMINARY ESTIMATES OF THE U.S. DEPARTMENT OF COMMERCE REVEAL THAT 2,026,200 TONS OF WOOD PULP WERE IMPORTED AND ONLY 139,500 TONS EXPORTED DURING 1939.
FROM U.S.
TO U.S.

ASSOCIATIONS

EXPECT LARGE CROWD AT NAT'L CHEMICAL EXPOS.

Application blanks for space at the National Chemical Exposition, sponsored by the Chicago Section of the American Chemical Society, are now available. The Exposition will be held December 11-15, at the Stevens Hotel, Chicago.

It has been announced that plans are under way to make this new venture of the Chicago Section not only completely comprehensive and diversified, but also to provide a program that will be attractive and interesting for the thousands who will come from all over the United States and Canada. It is estimated that about 40,000 chemists, engineers, research chemists, purchasing agents, production managers, plant superintendents and executives will be present.

Included on the advisory committee for the Exposition are Bruce K. Brown, Chicago, manager of research and development, Standard Oil Company of Indiana; J. V. N. Door, president of The Door Company; Ward V. Evans, professor of Chemistry at Northwestern University; Harrison E. Howe, editor of *Industrial and Engineering Chemistry;* S. C. Lind, president of the American Chemical Society; Walter J. Murphy, editor of *Chemical Industries;* Charles L. Parsons, secretary of the American Chemical Society; H. I. Schlesinger, professor of Chemistry at the University of Chicago; F. R. Wagner, chief chemist, Pure Oil Company, and E. C. Williams, Shell Development Company.

◆

ASSOCIATIONS PLAN JOINT SUMMER MEET

A joint summer meeting of American and Canadian pulpwood operators and foresters will be held July 31 to August 2, under the auspices of the Northeastern Regional Board of the American Pulpwood Association and of the Woodlands Section of the Canadian Pulp and Paper Association, on the operations of Finch, Pruyn & Company, near Newcomb, New York.

The aim of this meeting is to promote advancement in forest management and especially in the efficiency of logging through organized exchange of experiences and of progressive ideas between foresters and loggers of both countries. The attendance wil be mostly from the American Northeast and Eastern Canada, but some delegates probably will come also from the Lake States, the Appalachian Region and the South.

The program will consist of (a) Papers and discussions; (b) exhibition and demonstration of new logging machinery, equipment and supplies; and (c) inspection of progressive pulpwood operations of Finch, Pruyn & Company.

Arrangements are being made for preparation of papers on new developments and trends in logging technique, with emphasis on mechanization; on barking of pulpwood (from sap-peeling to drum-barking); on practical aspects of silvicultural cutting; and on industrial approach to forest protection. The papers will be presented by the representatives of the American Pulpwood Association and of the Woodlands Section, Canadian Pulp and Paper Association. Several other subjects will be brought up for discussion. Brief addresses will be presented by several high officials in the pulp and paper industry.

The morning of the last day will be given to an inspection of the pulpwood operations of Finch, Pruyn & Company, and the afternoon to inspection of machinery and equipment.

◆

▶▶▶ THE BULKLEY DUNTON bowling team won first place in a league composed of sixteen teams after thirty weeks of competition. The West Virginia and Alling and Corey teams tied for second place with a percentage of 611 as against the winner's 622.

◆

▶▶▶ DURING THE PAST MONTH a campaign was carried out by the Canadian Forestry Association in Montreal and elsewhere, in order to secure more members and also to obtain wartime funds. The drive was directed by John Bassett, president of the *Montreal Gazette.* It was stressed that the Association is making a vital contribution to Canada's war effort and that its work has become even more important now that the forests of Scandinavia are no longer accessible to war industries of the British Empire.

"We Can Store More Goods with these Northern Hi-Lifts"

—Warehouse Men Tell Us

"Exceptionally high hook lift of the Northern Hoist is certainly worth while in a warehouse where goods are stacked high. Much more can be stored in a given space," is the report of warehouse men.

Extra headroom provided by Northern Hi-Lift Hoists is valuable in many ways. It increases the effective height of building, or bay—may cut the cost of the building.

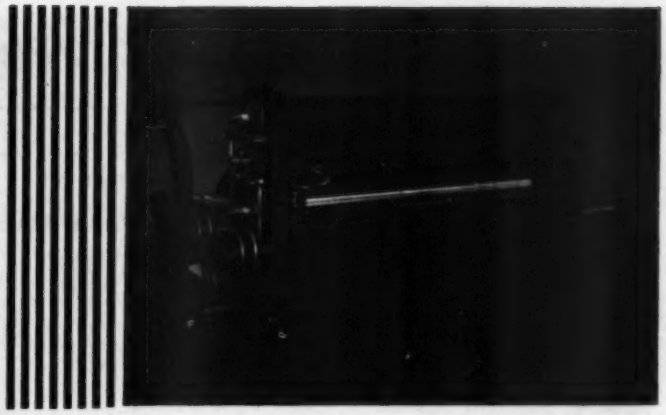
Northern construction is extremely sturdy. Frame is welded heavy steel plate. Gears machine cut, heat treated alloy steel—run in oil. Shafts liberal in size—ground to fit. Efficiency high, endurance exceptional.

Write for new Bulletin

NORTHERN ENGINEERING WORKS
2601 ATWATER ST. DETROIT, MICH.

CRANES *Northern* HOISTS

Sketches showing different arrangements possible. Many more not illustrated.



SHARTLE BRINGS YOU ALL THE WAX MACHINE FEATURES

No cross shafts to collect wax. Perfected wax guards —No wax on the floor. Rubber rolls easily removed without disturbing rubber end adjustments.

Labyrinth steam-heated magnesia insulated wax tank . . . deep enough to melt offset wax.

Equipped with Coe drainator to maintain uniform temperature in wax bath. Welded steel frames for rigidity and neat appearance. Micrometer adjustment reading to .0001".

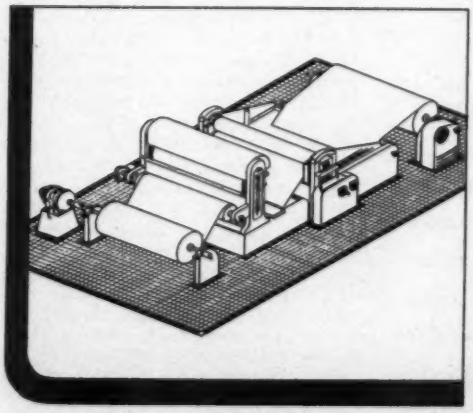
Front and rear journals adjustable separately or together. Instant release of pressure and overload compensating spring to prevent breakage of journals should wrapping occur.

Can be fitted with air pressure device for direct recording of pressures carried. Motor actuated dip rolls. Widths 36" to 84". Speeds 1200 FPM.

Further information furnished on request. Act today.

Shartle Brothers, Middletown, Ohio Division of the Black-Clawson Co.

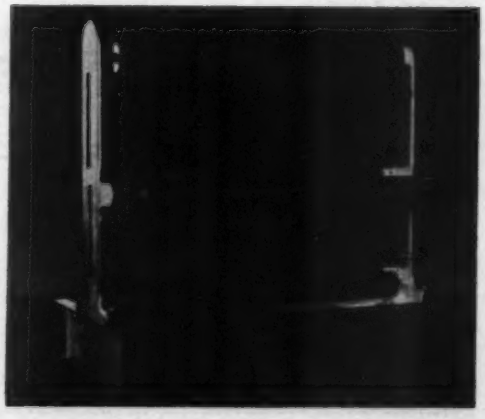
SHARTLE WAX MACHINES



Shartle Water Finish Attachment . . . outstanding product of its type. Built with the experience obtained from thirty successful installations without a single complaint.

Sketch of a Shartle Wax machine now being built and painted snow white. Photographs available on request.

Check Shartle For Your Converting Needs.



You are Cordially Invited . . .

▶▶▶ THE MANUFACTURERS OF equipment and supplies work hand-in-hand with the superintendents, the technical, research, and safety men of the pulp and paper manufacturing industry to keep every piece of equipment, every device, and every commodity necessary to the manufacture of pulp and paper up-to-the-minute in design, quality and efficiency. For that reason, no annual meeting of the Superintendents Association is complete without the fine display usually found at these conventions. According to the last report, nearly fifty companies have taken space in the exhibit which will be a part of the twenty-first annual meeting of the association to be held at the Netherland Plaza Hotel, Cincinnati, Ohio, June 18, 19 and 20. A very brief outline of some of the exhibits is given herewith. Some of the companies did not have their plans completed when this issue was ready to go to press; however, in addition to the features already announced, there will be more surprises for those who visit the exhibit.

Acme Steel Company

Let "Doc Steelstrap" diagnose your troubles in the loading and shipping of paper. Papermakers who have any type or kind of packing or shipping problems will find able advisors at the Acme booth. Looking after the visitors will be: J. G. Bucuss, sales manager of Acme's Unit Load Division, and W. S. Huss of the Steelstrap Division, together with N. L. Anderson and E. C. Evans, all of whom have had considerable experience in the preparation of paper-mill shipments.

Chromium Corporation of America

"Bright as a new dollar" will be the first impression of this company's very attractive display. But superintendents who must be economical will find it to their advantage to visit this booth where exhibits of satisfactory and profitable way of using surface coatings of either nickel or chromium will be on display. A comprehensive exhibit, this display will contain graphs of the physical properties of nickel and chromium; photographs of a nickel-plated first press roll in a board mill, and of a chromium-plated smoothing press roll in service; a photomicrograph of a heavy chromium deposit on steel, and various samples and full-sized pieces of equipment that will show the protective value of chromium to designed and etched surfaces and against corrosive action. Many other up-to-date items will be shown.

Downingtown Manufacturing Company

Come early and stay as long as you like for the free movies which will be the attraction of the Downingtown booth. Here superintendents can witness the stellar performance of Downingtown's recently-developed Suction Extractor Unit. Information, photographs and motion pictures will be available covering the performance of plain extractors, suction felt rolls, suction couches and presses and other equipment to enhance the operating efficiency of different types of paper machines.

The Foxboro Company

The control problem—one of the most important in the field of paper-making—can be discussed from every angle at the Foxboro booth where a display of a Verigraph control system for the control of moisture on paper drying, pneumatic loading equipment, automatic control of loading squeeze rolls and calender rolls, and a remote stuff gate control system will be shown. Think of all the questions you can—the Foxboro men, Messrs. Henry Ehrisman, O. R. Prescott, J. G. Callan and W. R. Stilwell—stand ready to answer 'em.

General Electric Company

An automatic "Dr. IQ" which flashes questions and answers relative to General Electric's synchronization of motors used in the paper industry is certain to attract many of the superintendents. Visitors to the G-E booth will be able to see a Selsyn transmitter illustrating the use of Selsyns to synchronize paper machine drive motors, thickness gages for the continuous or static measurement of paper thicknesses, as well as illuminated photographs of motors and control applicable to paper-making machinery. Always willing to discuss your problems will be W. W. Cronkhite, H. W. Rogers, F. M. Roberts, D. R. Shoults, A. F. Smith, C. F. Lee, P. Y. Tumy, F. E. Winslow, and W. L. Hilfrank.

Harris-Seybold-Potter Company

No matter how much you "cut up" at the convention, you may find it necessary to sharpen up a bit. If you do, there will be a seat for you at the Seybold Division's moving picture entitled "Seybold Has the Edge." This film depicts the Seybold Electric Auto Spacer and its use in paper mills. An actual spacer bar will be on display with which the operation of the Spacing device can be demonstrated. Photographs of mill installations of spacers and other Seybold machinery also will be on display. Messrs. Kinzeler, Shively, Baber, Dabney, and others of the Seybold organization will be waiting to greet you.

Hercules Powder Company

You can take a rest and still learn all about paper-making chemicals manufactured by the Paper Makers Chemical Department of Hercules Powder Company—thanks to the thoughtfulness of those who arranged this exhibit. A large display of the chemicals may be viewed by the superintendents while sitting in the plentiful—and comfortable—seats to be provided. Everyone will be most appreciative of this exhibit.

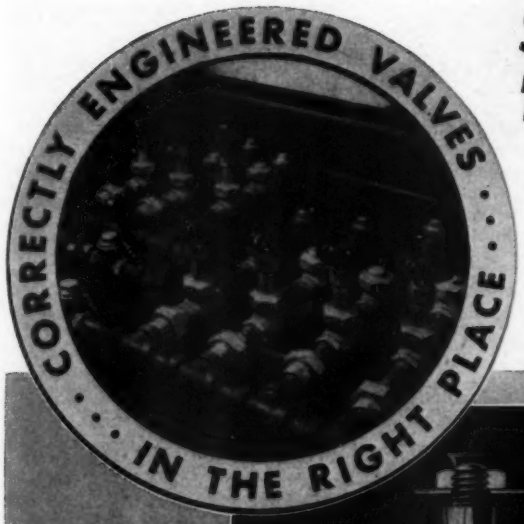
International Nickel Company

Monel's the big name at the International Nickel exhibit and superintendents will have the opportunity to see the extensive use of this metal in the paper industry as shown in this company's booth. The display will feature Monel paper mill equipment such as save-all pans, suction boxes, dandy roll covers, jordan bars, "K" Monel doctor blades, as well as Monel mill forms. Visiting papermakers will be very much interested in International's paper machine roll covered with Monel by a pressure welding process of recent development. The exhibit will be attended by a complete staff of experts from the company's home office and local headquarters.

Johns-Manville Company

Sure of attracting the attention of the majority of exhibit visitors will be the unique exhibit of this company. Johns-Manville strikes a new note of realism for exhibitions by its completely stocked paper mill maintenance storeroom which will be on display at the Convention. Added realism is given to the orderly rows of stocked shelves by the scenes of mill activity appearing through two windows which flank the storekeeper's desk in the rear of the room. Through one window will be seen a view of the beater room; through the other, the machine room. Both effects are achieved by brilliantly-lit murals set up behind the windows. Another touch of realism is the storeroom inventory sheet. Superintendents may procure copies of this sheet, check off quickly the maintenance conditions in which they are interested and be guided directly to the proper bin in which regular commercial size stocks of materials may be inspected. J-M maintenance materials on exhibit will include special packings, transite pipe, an asbestos-cement for pulp and stock lines, insulating materials, etc.

One of the highlights of the annual conventions of the American Pulp and Paper Mill Superintendents Association is the exposition of paper-making equipment. The exhibitors extend to all those who expect to attend the convention in Cincinnati on June 18, 19 and 20, a special invitation to call and inspect this very fine display.



Sturdily Constructed for Long Life, plus Easily Renewable, Non-Metallic Discs for Low Upkeep . . .

LUNKENHEIMER
BRONZE "N-M-D" VALVES

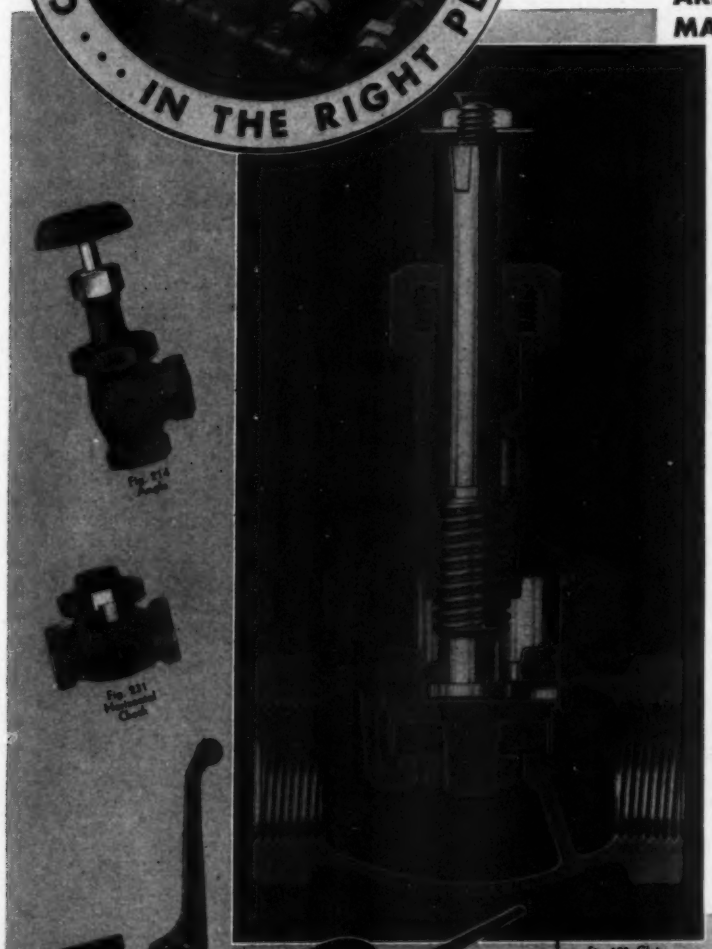
ARE "CORRECTLY ENGINEERED" FOR MAXIMUM ECONOMY ON THE JOB!

Offering the same basic qualities of strength and ruggedness provided in our line of Bronze Gate Valves described last month. LUNKENHEIMER "N-M-D" VALVES give the buyer, who prefers a valve of renewable, non-metallic disc design, a product in which "Engineered Superiority" is also readily apparent.

In addition to heavy wear-resisting bronze stem, accurately machined with thread pitches calculated to permit tight closure without crushing the disc, plus other features of bonnet and body construction which reduce to a minimum any chance of failure and facilitate servicing when ultimately required . . . the design of the Lunkenheimer disc holder makes disc replacement the simplest sort of operation. Four long guides, extending upward from the holder, not only prevent the disc from "cocking" when in service, thereby always assuring a perfect seat, but, with the valve slightly open, also serve to lock the holder onto the stem, permitting the use of only one hand to remove the entire stem and bonnet assembly.

SEEING IS BELIEVING!

All of the features mentioned above are tangible evidence of the all-over superiority of Lunkenheimer products which originates with the selection of only the finest materials and is constantly assured through painstaking manufacturing and testing processes. You'll have to take our word for these latter qualities, but our distributor's salesman will gladly take a Lunkenheimer valve apart and show you exactly wherein it visibly excels any valve you may be using. Ask him for such a demonstration on his next call!



Send for copy of our new Catalog No. 78. We will include our handy "Guide", which makes selection easy by grouping valves, boiler mountings, and lubricating devices according to pressures, temperatures, and service applications.

ESTABLISHED 1862

THE LUNKENHEIMER CO.
—"QUALITY"—
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 215-222 HUDSON ST., NEW YORK

LUNKENHEIMER

14-BA-67

Samuel M. Langston Company

An effective booth will be that of the Langston concern. Details and facts regarding this company's paper-making machinery will be simply, but adequately portrayed, through the use of "blow ups" of advertising material used by the company.

Link-Belt Company

At this exhibit everyone can "see through" an operating exhibit of Link-Belt herringbone-gear reducer and watch its internal mechanism. . . You guessed it! The exhibit will be in a transparent case. Then while there, you may stand still while a revolving display stand shows a complete arrangement of the various types of Link-Belt Shafer antifriction roller bearings, both mounted and unmounted units. There will be samples of babbitted type bearings, take-ups and other power transmission products; Twin Disc friction clutches; chains for conveyors, drives, barking drums; samples of Link-Belt Silverstreak silent chain and Silverlink roller chain, including the "RC" flexible coupling. Holding out the "Welcome" sign will be H. F. Weber, of Chicago; R. B. Holmes and G. H. Woody, of Indianapolis; H. D. Mitchell, Philadelphia; and H. D. Alexander and W. J. Nighbert, of Baltimore.

Mason-Neilan Regulator Company

Here's a premiere you won't want to miss. This company will show for the first time to the paper industry, a line of improved and restyled indicating, recording and control instruments. Notable features are: a new fast, amplifying pilot; streamlined, compact, universal mounting cases, newly-designed airplane type dials and scales; new type chart plate; new type door lock and gaskets. "First Nighters" will be greeted by A. H. Stanton, manager of the Mason-Neilan Pulp and Paper Division. He will be assisted by James McAlear and C. W. Wood.

Mt. Vernon Woodberry Mills, Inc.

A complete display of various cotton and asbestos dryer felts manufactured by this company, is planned to catch the eye of superintendents at the Convention. Considerable publicity will be given the Woodberry reinforced (Style 887) patented felt.

Nash Engineering Company

Here's one glass house no one will want to throw stones at. The Nash Pump of Glass will be operating at this company's exhibit. Here also will be shown parts of the company's conical vacuum pump for paper mill work, as well as an assembled two-stage vacuum pump. And, of course, there will be literature about everything made by Nash. Visitors will be welcomed by Carlo Vicario, C. L. Clark, and D. R. Fournier.

Reliance Electric & Engineering Company

You have all heard that old proverb that "A picture is worth a thousand words." We don't know how many words should be charged to a miniature display electrically operated, but we would hazard the guess it should be at least a good-sized book. In the Reliance display planned for Cincinnati, a control panel, so located as to be readily accessible to visitors to the Reliance booth, will permit everyone who wishes to do so to put the equipment through its many paces. There will also be a working display of its all-electric, V-S adjustable-speed drive. A large, orange-hued gear wheel, connected to the V-S Drive and mounted in a neon-lighted, glass-enclosed case, will be the eye-arresting used to demonstrate the starting, stopping, reversing, dynamic braking, and wider range of operating speeds possible with the V-S unit with the touch of a button or the twist of a knob. If you want to discuss problems and load data of paper and board machines, super-calenders and electric motor applications generally, R. A. MacDowell, the company's Cincinnati district manager, and R. H. Smith and P. W. Arnold of the company's Cleveland application engineering staff, will be at your service.

Shartle Brothers Machine Company

Just inside the Hall of Mirrors at the Netherland-Plaza will be found the attractive Black-Clawson, Shartle Brothers exhibit. Due to the extensive display of products at this exhibit, it is certain that many Supers will want to make a point of viewing this booth. On the Shartle Brothers side of the exhibit will be three four-foot panels depicting the pieces of equipment that were first to be introduced by Shartle Brothers, as well as a complete description of the Miami high density pulper, the breaker beater, and the S-77. There will also be included a large display of rejected material taken from mixed paper as removed by the Shartle Selectrap. At the end of the booth will be a movie screen showing actual installations of Shartle equipment. Black-Clawson will exhibit spiral drives and its new fourdrinier shake with an operating model. An operating model of the Coe Drainator will also be shown and, as a unique feature, there will be displayed an animated flow chart wherein the company will be able to build up any system that a visitor may desire, using actual photographs placed on a large blackboard with pipe lines drawn in by chalk. This can be photographed to be taken away or it can be mailed. Ample representation will, of course, be present . . . and, incidentally, there'll be plenty of comfortable chairs.

Stickle Steam Specialties Company

Papermakers will feel right at home at the Stickle Steam exhibit. This company will exhibit a display which will represent an actual installation on a paper machine which will be a perfect simulation of the Stickle control in action. Featured this year will be the Stickle automatic tension and thermal control. The company will also show the new line of valves of the single-seated pilot adjusted type of stainless steel or Duriron trim, the new improved Micro adjustable orifices and the new thermal control for controlling the surface temperatures of the dryers at the same time a visible check of the flow of condensation from the dryers and the temperature of the condensation leaving. Stickle will have plenty of information to hand out and will staff its booth with able representatives in the field.

Wallace & Tiernan Co., Inc.

"Death to Bugs" will be the theme of this exhibit. Particular emphasis will be laid upon the sterilizing processes to guarantee purity and safety in food wrappings and containers. Chlorine control equipment ranging in capacities from ounces to tons of chlorine per day will be shown. Notable among these will be the new small chemical reagent feeder for accurately controlled applications of chemical solutions. Rounding out the complete line of W&T chemical feeding equipment for gaseous liquid or dry chemicals, considerable interest will surely center around the W&T Dry Chemical Feeders. The exhibit will be manned by R. B. Martin, J. A. Nicklis aid M. I. Keirn, all of whom are well qualified to discuss in detail water purification, sliming or chemical feeding problems in any type of mills. With increasing demand for food package and food wrap output, low bacterial count papers and methods of biological control will be subjects of unusual interest and discussion.

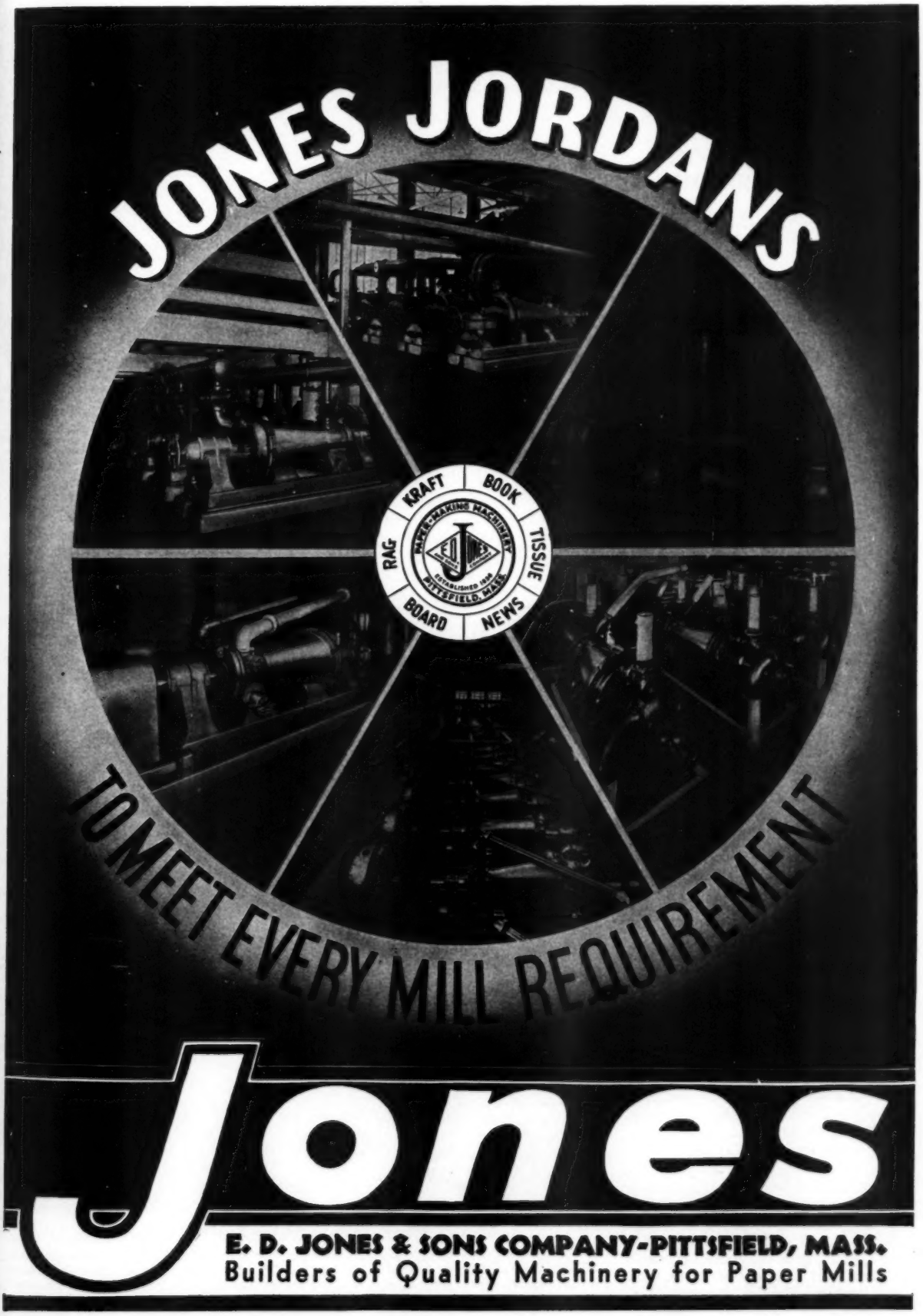
Warren Steam Pump Company, Inc.

The Warren company feel pretty "chesty" about the main exhibit at its booth, and so they should, for it's the Warren centrifugal chest pump. This pump will be the center of attraction at the Warren booth and will be flanked by the company's motor driven rotary display. Supers will evince plenty of interest in the enlarged delivery chart, shown by permission of one of the larger paper mills, and which gives a graphic account of a 24-hour record of stock level in the stuff box. Few visitors will want to miss this exhibit.

Other Exhibits

There are many more unique and educational exhibits in store for those who attend the convention. Other companies listed for displays at the exposition are:

American Rolling Mill Co.
Barco Manufacturing Co.
Beloit Iron Works.
Bevis Machine Co.
Cameron Machine Co.
Corn Products Refining Co.
DeZurik Shower Co.
De Walt Products Corp.
Duriron Co.
Hercules Powder Co.
Jeffery Manufacturing Co.
Kidder Press Co.
Magnus Chemical Co.
Midwest-Fulton Machine Co.
Morrow Manufacturing Co.
Nichols Engr. & Research Corp.
Penick & Ford, Ltd.
Pusey & Jones Corp.
Robbins & Myers Inc.
Sandy Hill Iron & Brass Works, Inc.
Socony-Vacuum Oil Co.
Taylor Instrument Cos.
Walker Brothers.


JONES JORDANS
KRAFT
BOOK
TISSUE
NEWS
BOARD
RAG
PAPER-MAKING MACHINERY
ESTABLISHED 1848
PITTSFIELD, MASS.
TO MEET EVERY MILL REQUIREMENT
Jones
E. D. JONES & SONS COMPANY-PITTSFIELD, MASS.
Builders of Quality Machinery for Paper Mills

ALLIED

MERGED—DILTS, BLACK-CLAWSON AND SHARTLE

The merger of the Dilts Machine Works, Inc., Fulton, New York, with the Black-Clawson Company, Hamilton, Ohio, and the Shartle Brothers Machine Company, Middletown, Ohio, was announced recently. This move brings together the two largest builders of stock preparation equipment in this country.

President H. L. Kutter of the Black-Clawson Company has advised that the Dilts plant will retain the same personnel and operate from the same location. The sales engineers of the Black-Clawson, Shartle Brothers, and Dilts organizations will all be able to offer the complete line of the three companies.

The Dilts plant was organized in 1867 and during the last few years have specialized in the production of their well-known Hydrafiners, Classifiners, beaters, breaker-beaters, agitators, washers, etc. About a year ago Dilts introduced the Hydrapulper, which has met with great success.

The three plants employ about 884 men, the Black-Clawson plant being devoted to the manufacture of fourdrinier, cylinder and Yankee machines; pasters, cutters, etc. Shartle Brothers, like Dilts, have always specialized in stock preparation and processing equipment.

◆

GLYCERINE EXHIBIT

A unique three-dimensional group, portraying the role of glycerine in the paper industry, is one of the most interesting features of the novel glycerine exhibit now on display at the New York Museum of Science and Industry in Rockefeller Center.

This figure is one of twenty-four similar miniature groupings in actual colors, designed to indicate graphically the uses of glycerine in the major fields of modern industry in which this versatile product plays a part. The new exhibit translates the glycerine story for the general public. Continually changing colored slides illustrate some of the many applications of glycerine in home cookery and in the household, while display cases, brightly illuminated, show samples of glycerine-containing industrial products, synthetic resins, packaged cosmetics, pharmaceuticals, and a variety of commercial food products in which glycerine finds a place. In paper manufacture glycerine is in increasing demand for halftone printing and color printing and also because of the constant development of new types of paper whose manufacture demands a softener.

The unusual dramatization of glycerine was motivated by the interest manifested in the Association of American Soap and Glycerine Products exhibit at the Seventeenth Exposition of Chemical Industries in New York City. The same Association has arranged the present exhibit.

◆

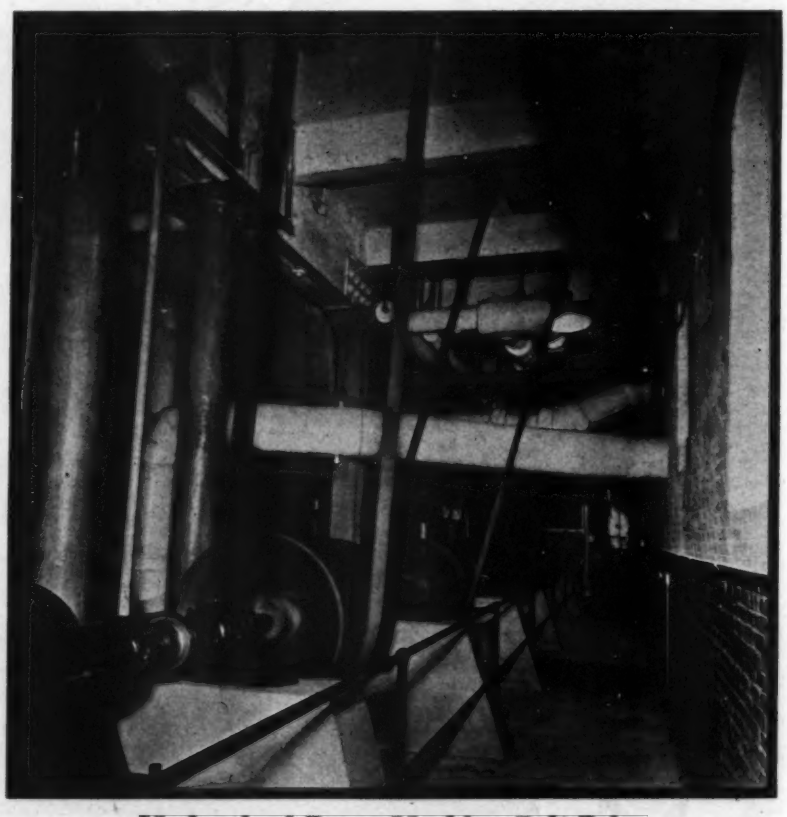
DESERT CHEMICAL BUILDS SODIUM SULPHATE PLANT

Construction of a large plant for production of anhydrous sodium sulphate, at Dale Lake, California, is now being rushed to completion by Desert Chemical Company. An analysis of markets for this product is being made, which will determine the extent of 1941 production. Contemplated production for 1941 is 50,000 tons, but this can be increased materially should conditions warrant. Approximately five thousand tons will be available for sample shipments by the middle of July this year.

Methods for the production of sodium sulphate at Desert Chemical Company's properties has been under test for several years and have been successfully proven on a commercial basis. The company is amply financed for large-scale production, with the board of directors representing important Pacific coast business interests.

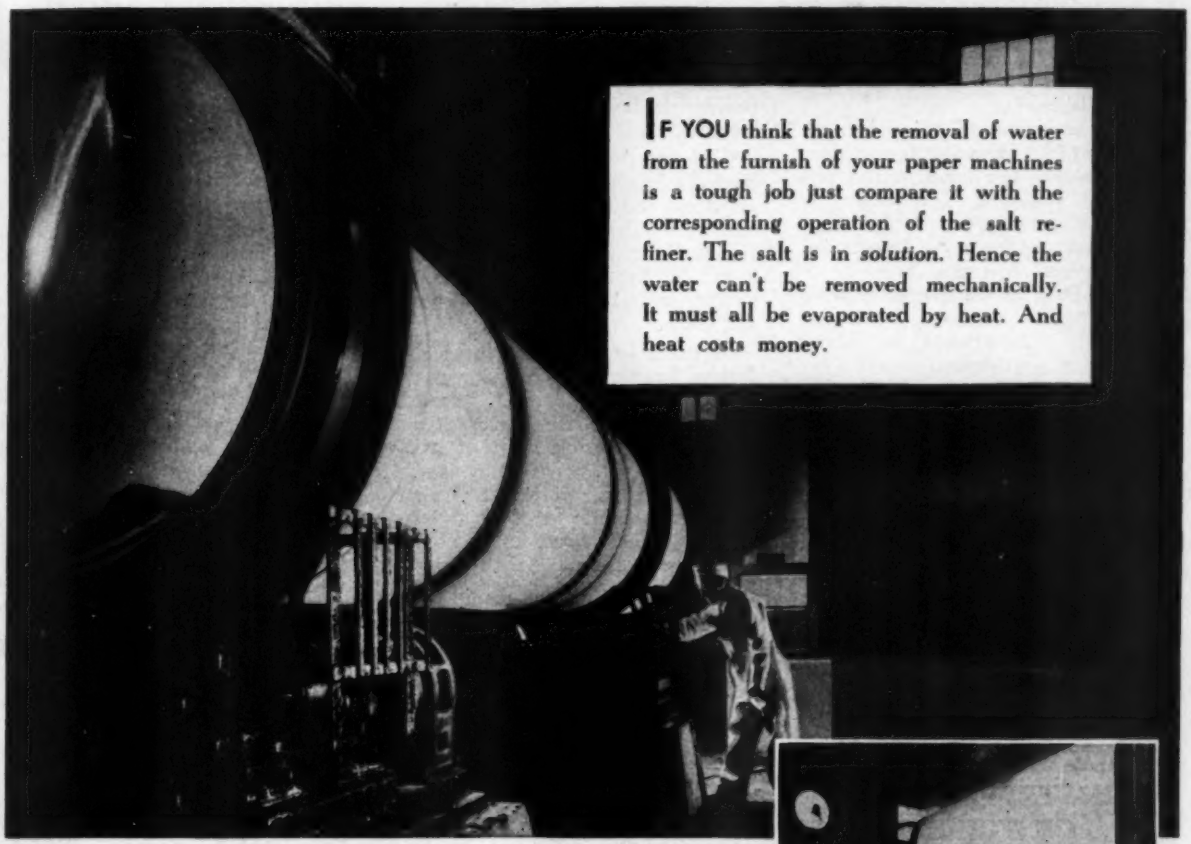
Construction started late in 1939 is now being rapidly completed. This program includes installation of a large power plant, housing accommodations and increased vat and pipe line capacity. Many wells have been drilled and vats built, under the preliminary development program. Ample water for full production has been shown by a seven-year study of the available supply.

Forty-four test wells drilled on 500 acres of the company property indicates more than 13,000,000 tons of



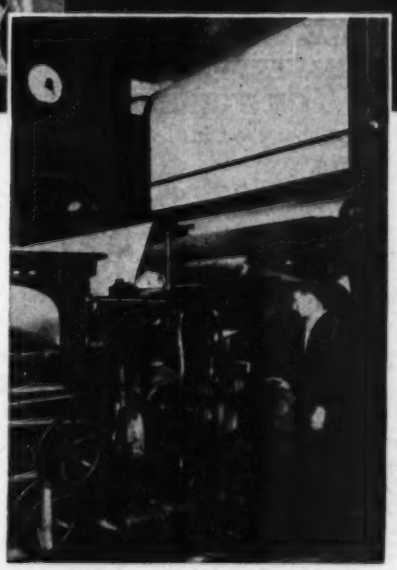
Modernized Paper-Machine Belt Drive

On a paper machine recently modernized at its Mechanicville (New York) plant, the West Virginia Pulp and Paper Company has had the Beloit Iron Works install a new type Beloit 137-in. trim fourdrinier part. Illustrated above are the Highflex belts installed on this machine. These belts, made by The B. F. Goodrich Company, are spliced endlessly on the drives.



IF YOU think that the removal of water from the furnish of your paper machines is a tough job just compare it with the corresponding operation of the salt refiner. The salt is in *solution*. Hence the water can't be removed mechanically. It must all be evaporated by heat. And heat costs money.

This rotary dryer of International Salt Co., Inc., fairly "roars with heat." This plant uses 13,000 cu. ft. steam per minute.



THE FIBERS of your furnish are in *suspension*. You extract the bulk of the water by gravity and by pressure, leaving only the remaining moisture to be evaporated. By equipping your machine with a Hamilton Felt you immediately increase its efficiency and deliver dryer sheets to the dryers. Less steam is needed. Less money for fuel.

• *From the thinnest tissue to the heaviest board, there is a Hamilton Felt that will do your work better, faster and at lower cost.* •

SHULER & BENNINGHOFEN, HAMILTON, OHIO

• Miami Woolen Mills •

Hamilton Felts

• Established 1858 •

sodium sulphate in that limited area. Test wells over the balance of the property are the basis of estimates that between twenty and thirty million tons are available.

Analyses of the sodium sulphate are uniformly 99.5 per cent pure or higher, with less than five-hundredths of one per cent insoluble. The product is iron free, non-hygroscopic and large in structure, so that it can be supplied in any screen required.

In addition to the sodium sulphate and salt cake marketed by Desert Chemical, a by-product is sodium chloride of high purity.

S. Lee Richardson is president and production manager of the company and other officers include Vice President George Pepperdine, head of the Pepperdine Foundation; Vice President Mr. Christensen; Secretary Henry D. Dargert, an official of Floatations, Inc., and Bardco Company; Treasurer C. P. Shattuck; and Director James Q. Henry, president of Pacific Coast Elevator Company.

Executive offices of Desert Chemical Company are at 4031 Goodwin Avenue, Los Angeles.

◆

FIRST LIBRARY INSTALLATION OF PRECIPITRON

First library in the world to be ventilated with electrically cleaned air is the new Virginia State Library at Richmond, which recently purchased from the Westinghouse Electric and Manufacturing Company five Precipitron electrostatic air cleaning units having a total capacity of 57,750 cubic feet per minute at a cleaning efficiency of 85 per cent on the "blackness test" basis specified by the National Bureau of Standards.

The equipment, a description of which appeared in the November (1939) issue of THE PAPER INDUSTRY AND PAPER WORLD, will be used not only for removing dirt particles from the air, but also for precipitating minute particles of air-borne sulphurous compounds, which are said to be one of the most important factors in the deterioration of book papers. The new Virginia State Library will house many rare and valuable volumes.

◆

WESTINGHOUSE MAKES SURVEY OF THE WEST

A 6,000-mile business survey of the West is now being made by five head officials of the Westinghouse Electric and Manufacturing Company. Converting a railroad car into temporary executive offices, the group will get first-hand impressions of 1940 business conditions and will meet with business, civic, educational and professional leaders in six important communities.

Chairman Andrew W. Robertson is head of the group which is made up of Ralph Kelly, vice president in charge of sales; Marvin W. Smith, vice president in charge of engineering; L. W. Lyons, treasurer, and A. H. Phelps, general manager of purchases and traffic.

"With a large part of the world divided by war and economic uncertainty," Mr. Robertson said, "it seems only natural that business men should explore every possible means of maintaining this country's peace by nurturing our potential prosperity. We are hopeful that these on-the-spot talks with men in the West will be a link in the chain of economics and friendship which ties our country together."

◆

NEW ARMSTRONG DIVISION HEADED BY F. G. STAMM

The appointment of Frederick G. Stamm, well-known authority on paper drying, to head a newly-organized paper mill division, was announced recently by the Armstrong Machine Works, Three Rivers, Michigan. Mr. Stamm and the Armstrong engineers have pooled their experience and resources to design and build advanced types of equipment for controlling drying on and drainage of paper machines.

The new division, according to reports, is prepared to render specialized paper mill engineering service in all parts of the United States and Canada and includes application of the Armstrong-Stamm graduated dryer temperature control, sheet moisture control and drainage system in addition to application of various individual products in the Armstrong-Stamm line.

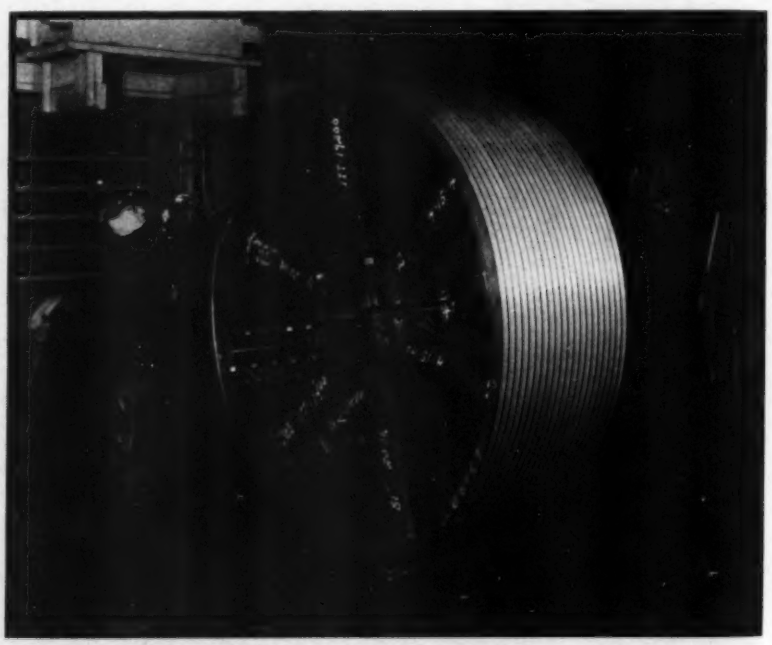
It is reported that during the past three years, numerous installations have been made and all equipment and methods are said to be proven thoroughly. The announced aim of the company is to offer the most advanced and most comprehensive service available to the paper industry.

◆

ELEKTRO HAS A DOG

"A man's best friend is his dog" is an old adage that always seems to hold true even when its a mechanical man and a mechanical dog. At least, that's what Westinghouse engineers seem to think.

As companion for its animated robot Elektro which amazed audiences at



Large Drives for Southern Paper Mill

A recent two-car load shipment of 65 complete Texrope drives from Allis-Chalmers Manufacturing Co. for a new paper mill in Alabama, included a number of very large sheaves. Shown here is one of seven 81-in. pitch diameter semi-steel sheaves, with 20-in. "D" section grooves, designed and built for driving Horne beaters. After being cast and machined at Allis-Chalmers West Allis Works, each of these double arm, split sheaves had a finished weight of approximately 5200 pounds.

We invite requests for analyses and quotations on

Anhydrous

SODIUM SULPHATE

- SALT CAKE - SALT

DESERT CHEMICAL COMPANY

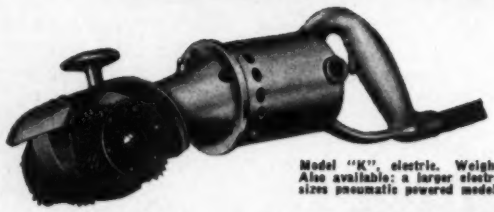
4031 GOODWIN AVENUE • LOS ANGELES, CALIFORNIA

Officers

S. Lee Richardson, *President*
George Pepperdine, *Vice-President*
M. Christensen, *Vice-President*
Henry D. Dargert, *Secretary*
C. B. Shattuck, *Treasurer*

AURAND

CLEANING TOOLS



Model "K", electric. Weight 8 lbs. Also available: a larger electric and 2 sizes pneumatic powered models.

JUST WHAT YOU NEED

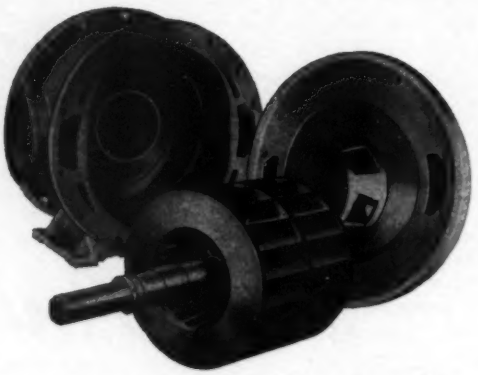
to remove hard accumulations from tanks, vats, kneaders, agitators, beater bars, at least cost in time and labor.

Powered rotary chipping, depth controlled, provides positive, even, removal of foreign matter from any hard surface. A great advance over scraping and wire-brushing by hand. Cleaning heads renewable.

Write for descriptive circular No. 649.

AURAND MFG. & EQUIP. CO.
2643 Colerain Avenue • CINCINNATI, OHIO

SIMPLICITY



NASH VACUUM PUMPS HAVE ONE MOVING PART

Operating advantages made possible by the Nash principle, and present in no other type of vacuum pump, permit a new level of operating economy. Nash Vacuum Pumps have but one moving part, a rotor cast in one piece, and revolving without metallic contact. There are no valves, no pistons or sliding vanes, no internal parts requiring wear adjustment or lubrication.

NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

the 1939 World's Fair at New York, the Westinghouse Electric and Manufacturing Company has introduced Sparko, a friendly little canine, who barks, growls and wags his tail in a realistic manner. Sparko was built by J. M. Barnett, who also produced his master, Elektro. The 65-pound Scotty is a little over a foot high at the shoulders and 29 inches from nose to tail. His aluminum skin keeps his weight down and inside him are two 1/20 hp. motors. One motor makes him walk; the other sets him down and stands him up. A special "tail-wagger" mechanism makes Sparko wag his tail while he follows his master around. Both Elektro and Sparko are located at the Westinghouse exhibit building at the 1940 World's Fair.

◆

▶▶▶ THE ANNUAL TECHNICAL SALES CONFERENCE of the Detroit, Midwestern, Chicago and Southwestern Divisions of Oakite Products, Inc., was held at Chicago's Lake Shore Athletic Club recently with forty-six field service representatives attending. It was reported that discussions revealed the fact that paper mill executives are showing increased interest in newly-developed Oakite cleaning materials and methods.

RYERSON HOLDS OPEN HOUSE

As a climax to large-scale preparation to acquaint customers with the plant facilities and stocks of Joseph T. Ryerson and Son, Inc., Chicago, the steel company held Open House on May 11 for more than 3,000 visitors. The big crowd included many out-of-town guests who, together with the others, witnessed the opening of the new steel warehouse and then were conducted on special tours of the entire plant.

Guides stationed at salient points throughout the warehouse and offices explained the many technical exhibits and processes to the interested visitors. A feature of the tour was a visual explanation of the Ryerson Certified Steel Plan and the tracing of a route of a typical steel order from the order department to the loading floor.

Full scale operations in all departments enabled visitors to see the latest methods of various steel operations. Displays of Timken mechanical tubing with sections in various stages of manufacture and new Ryerson metal working equipment were viewed with interest by the Open House guests. The Ryerson Open House was believed to be one of the biggest ever held in the Chicago area.

▶▶▶ EFFECTIVE JUNE 1, the western sales office of Titanium Pigment Corporation, New York City, was moved from St. Louis, Missouri, to Chicago, Illinois. The address is 104 South Michigan Avenue; the telephone number is Randolph 8494. All carload orders, correspondence, and other matters should be addressed to Chicago. Less than carload orders should be sent direct to the warehouses as formerly.

◆

MASS. PUBLISHES "AN OPEN BOOK"

A result of six months' survey by the Massachusetts Development and Industrial Commission in collaboration with the Associated Industries of Massachusetts is a new book entitled "An Open Book," recently published by the former group. The plastic-bound book is of a descriptive nature and sets forth the advantages of the State of Massachusetts as a "home for industry." The booklet, among other things, points out that Massachusetts is first in the manufacture of envelopes and greetings cards, second in paper goods and fourth in paper manufacture. Complete data as to labor conditions, transportation, taxation, markets, etc., are included.

FOR DEPENDABLE VALVE SERVICE • SPECIFY

POWELL VALVES

FIG. 3003 CLASS 300 CAST STEEL GATE VALVE

FIG. 375 BRONZE GATE VALVE

FIG. 190 IRON BODY GLOBE VALVE

LONG LIFE, ALL TYPES AND SIZES, EXACTING WORKMANSHIP

FIG. 102 BRONZE GLOBE VALVE

FIG. 1460 IRON BODY GATE VALVE

FIG. 1793 IRON BODY GATE VALVE

WRITE FOR FURTHER INFORMATION AND DETAILS

THE WM. POWELL COMPANY

CINCINNATI, OHIO

S A F E T Y

RIVER VALLEY SAFETY CONFERENCE

More than 200 delegates attended the Pulp and Paper section of the tenth annual Wisconsin River Valley Safety Conference held at Wisconsin Rapids, Wisconsin, on Tuesday, May 14.

George W. Meade, president of Consolidated Water Power and Paper Company, was paid high tribute by Chairman Voyta Wrabetz, of the Wisconsin Industrial Commission, as one of the state's far-seeing employers who aided materially in bringing about enactment of the workmen's compensation law in 1911.

Mr. Wrabetz was the principal speaker at the banquet closing the conference, which was attended by approximately 600 delegates representing 60 industries.

Called the "United States grand champion safety worker," Ernest Jennerjahn, an employee of the Kimberly-Clark Corporation, recently completed 145,316 consecutive man hours without lost-time accident.

Mr. Jennerjahn has worked this span (47 years) with the K-C organization, starting as a third hand on a paper machine in 1893 and subsequently becoming back tender, millwright, and oiler before becoming a roll grinder in 1905. For this record, he was honored on May 23 at the Conference when he was presented with a framed certificate and a pen and pencil set. Three other K-C employees, C. VanderVelden and Joseph Van Rooy, and Alfred Doran, also won Safety Council awards at the meeting.

F. H. Rosebush, Industrial Relations director of the Nekoosa-Edwards Paper Company, was chairman of the Pulp and Paper section, and J. J. Plzak, Consolidated claims manager, served as toastmaster at the banquet and chairman of the conference. The 1941 conference was awarded to Stevens Point, according to an announcement by Mr. Plzak.

◆

▶▶▶ A TRAGIC ACCIDENT which resulted in the death of four workmen and the injury of six others was reported from Edmundston, N. B., where, it was said, the workmen were fighting a fire at the plant of the Fraser Companies, Ltd. According to press reports, the men were fatally injured when a pulpwood conveyor collapsed. The fire was brought under control after a three-hour battle.

▶▶▶ The many friends of George E. Burns, well-known safety engineer of the National Safety Council, will sympathize with him in the passing of his mother, *Mrs. Rebecca Burns*, of Chicago. Besides George E. Burns, another son, Alfred E., survives.

◆

SAFETY BOOKLET ISSUED BY C-Z

The Crown Zellerbach Corporation has issued a very interesting and worthwhile booklet in the cause of safety and first aid entitled "The Years of Paper."

Issued in the hope that it will stimulate intelligent and active interest, the booklet tells a story of the safety work at the C-Z mills and Rayonier, Inc., and contains pictures of championship first aid teams, stories of mill men's first aid work and general items of safety work. A letter of commendation from the Supervisor of Safety for the State of Washington to the Crown Zellerbach Corporation appears on the inside front cover.

◆

RAYONIER FIRST-AID TEAM CHAMP SQUAD

The first-aid team of the Rayonier, Inc., mill at Port Angeles, Washington won first place in a state first-aid meet at Seattle on May 25.

First making a score of 99 in the pulp and paper division, the Rayonier team, entered the finals against the winners from four other industrial divisions and placed first with a score of 97.4. A few weeks earlier the Rayonier team took top honors in a field of nine Crown Zellerbach and Rayonier mill teams competing at a special meet in Portland.

Members of the championship squad are Foster Beal, Captain; Riley Nelson, Earl Henry, Harold Orem, and Ernest Virginia; Chester Bombardier, alternate; Elmer Gallaway, patient; E. H. Wagner, judge, and Eldo Florence, team representative. S. W. Grimes is the mill's safety and personnel supervisor, assisted by Merrill Cashman.

◆

▶▶▶ VACATION TIME is here, but don't forget to look ahead to the National Safety Congress which will meet in Chicago October 7 to 11. The Stevens Hotel will be convention headquarters, and those who expect to attend should make reservations now.

◆

CANADIAN ASS'N ACTS TO CURB AXE ACCIDENTS

Due to an investigation which brought to light that annual axe accidents cost about $1,000,000, the Canadian Pulp and Paper Associations Woodland Section has decided to finance the practical study of manual and mechanical cutting methods.

It is estimated that at least two-thirds of the total cost of bush accidents take place in cutting operations. The study is expected to meet three objectives: (1) reduction in accident costs, (2) rationalization and standardization of tools, and (3) adaptation of mechanical equipment to Canadian wood conditions.

The Paper Industry Safety Contest

July 1, 1939 to June 30, 1940

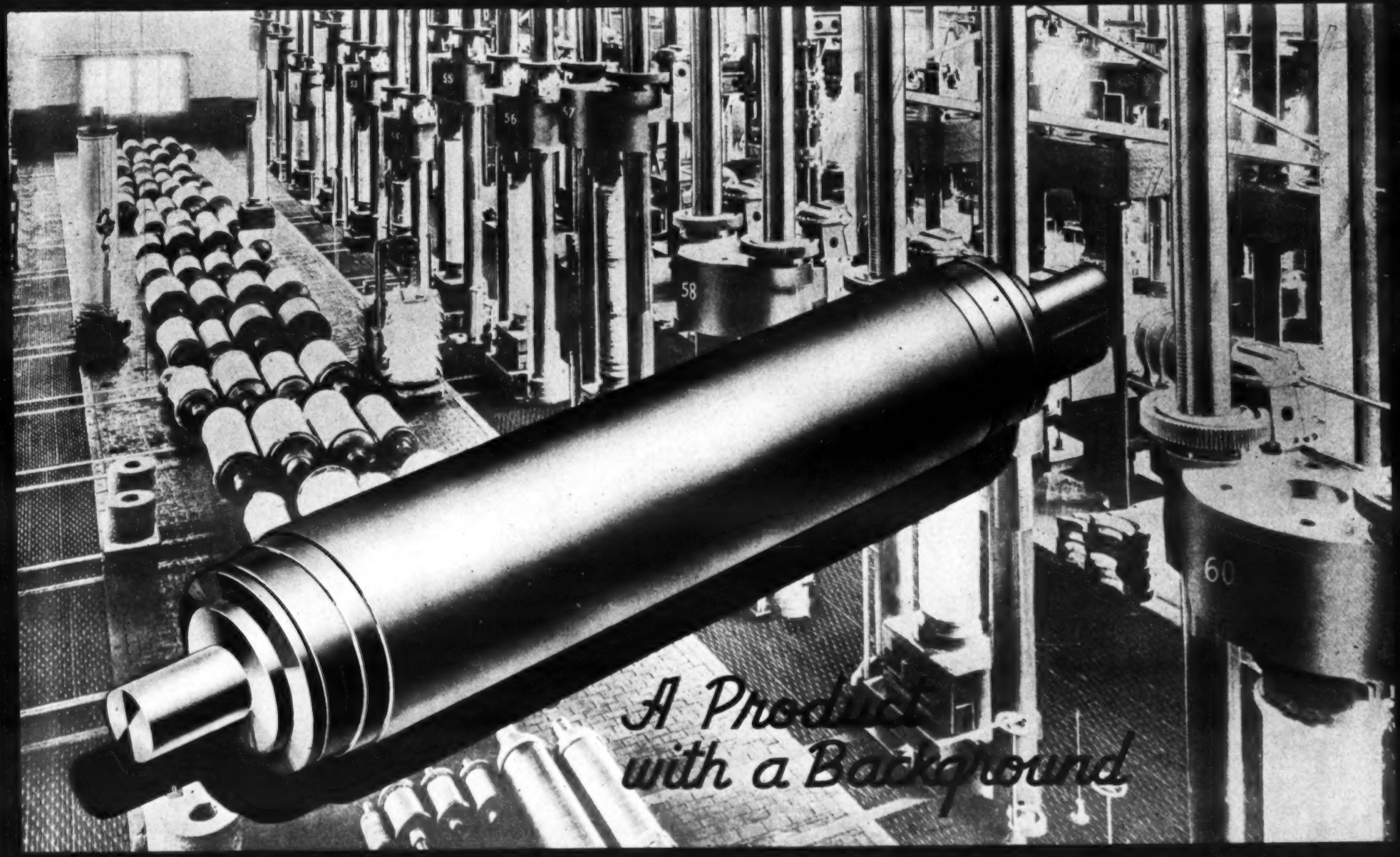
Out of 177 mills reporting for April, 12 have perfect record

PERFECT SCORES

Division I—Pulp and Paper Mills

PARTICIPANT	MILL	LOCATION
GROUP A		
GROUP B		
GROUP C		
Strathmore Paper Co.	Woronoco	Massachusetts
American Writing Paper Corp.	Linden Div.	Holyoke, Mass.
GROUP D		
The Mead Corporation	Sylva Paperboard Co.	Sylva, N. C.
Crown Zellerbach Corporation	Crown Willamette Paper Co. Div.	Lebanon, Ore.
Spaulding Fibre Co., Inc.	Milton	New Hampshire
United States Gypsum Company	North Kansas City	Missouri
International Paper Co.	Livermore No. 11	Livermore Falls, Me
The Mead Corporation	Nashville	Tennessee
Hollingsworth & Whitney Co.	Abenaquis Mill	Madison, Me.
International Paper Co.	Riley No. 23	Riley, Me.
Spaulding Fibre Co., Inc.	Hayes	New Hampshire
Division II—Paper and Board Re-Manufacturing		
Bay West Paper Co.	Green Bay	Wisconsin

PERKINS CALENDER ROLLS



B. F. PERKINS & SON, Inc. HOLYOKE • MASS

NAMES *in the* NEWS

Personals

WESCO MADE S. M. OF FOX RIVER PAPER

At a recent meeting of the board of directors, Paul C. Wesco was appointed Sales Manager of the Fox River Paper Corporation, Appleton, Wisconsin.

Mr. Wesco, who has had nearly twenty-five years in the sales field, has been directly connected with the paper industry for nineteen years. In 1933 he resigned as sales manager of the Tuttle Press to join the Fox River organization, thus entering the fine paper field.

◆

▸▸▸ *Joseph V. Santry,* executive vice president of the Combustion Engineering Company, Inc., since 1933, was elected to the presidency of that company at a recent meeting of the board of directors. Mr. Santry succeeds *Frederic A. Schaff* who was elected vice chairman of the board. Mr. Santry became identified with Combustion Engineering shortly after its inception in 1914 and was elected a vice president in 1918. He is widely known throughout the power industry.

◆

▸▸▸ After spending some time in paper mill work in Sao Paulo, Brazil, *Homer Eaton* has returned to the States and is now associated with the technical staff of the Michigan Alkali Company, Wyandotte, Michigan.

◆

BOESCHENSTEIN HONORED BY U. OF ILLINOIS

For his work as a pioneer and leader in the development of glass in thread-like fiber form, Harold Boeschenstein, president of the Owens-Corning Fiberglas Corporation, Toledo and Newark, Ohio, has been chosen an outstanding alumnus of the College of Commerce and Business Administration of the University of Illinois. Mr. Boeschenstein graduated from the University of Illinois in 1920.

Charles M. Thompson, dean of the College of Commerce, in announcing this honor, wrote that "in honoring Mr. Boeschenstein, the faculty and the student body of this college are really honoring themselves." Mr. Boeschenstein has been president of the Owens-Corning organization since its formation in November, 1938. Previously he had been vice president and general manager of the Owens-Illinois Glass Company. Under his direction the products of the company have become major factors in scores of important American industries as insulation materials and for decorative fabrics.

◆

▸▸▸ Now chief engineer of the Jeffrey Manufacturing Company's conveyor division, is *Stanley M. Mercier* who, in his new capacity, directs all conveyor, engineering and engineering sales activities. Born and educated in England, Mr. Mercier has enjoyed a

Stanley M. Mercier

varied experience in industrial and construction engineering, design and sales and has been associated with some of the most outstanding construction operations in the country during the last decade.

◆

▸▸▸ *Dr. Howard A. Smith,* until recently research metallurgist with the Rustless Iron and Steel Company, Baltimore, has been made chief metallurgist of the Duraloy Company, Scottdale, Pa. Dr. Smith was previously associated with the Republic Steel Company at Canton, Ohio, where he was in charge of the stainless steel development laboratories.

PROMOTIONS AT TITANIUM PIGMENT

G. W. Corddry, general sales manager, and L. G. Reichhard, production manager, of the Titanium Pigment Corporation, New York City, were elected to the company's board of directors recently. D. E. Edgerly, formerly western sales manager, was elected a vice president. Mr. Edgerly will still be connected with the sales activities of the corporation.

In addition it was announced that K. W. Ericson, formerly in charge of sales in the Chicago area, has been appointed western sales manager. Mr. Ericson succeeds Mr. Edgerly in this capacity. The western sales office was moved on June 1 from St. Louis to Chicago.

◆

▸▸▸ *J. S. Bennett* has been appointed manager of sales for the American Engineering Company, Philadelphia, and *William H. Schultze* has been appointed sales manager of the Marine Division, it was announced recently. *C. L. Myers* will continue as sales manager of the Stoker Division.

◆

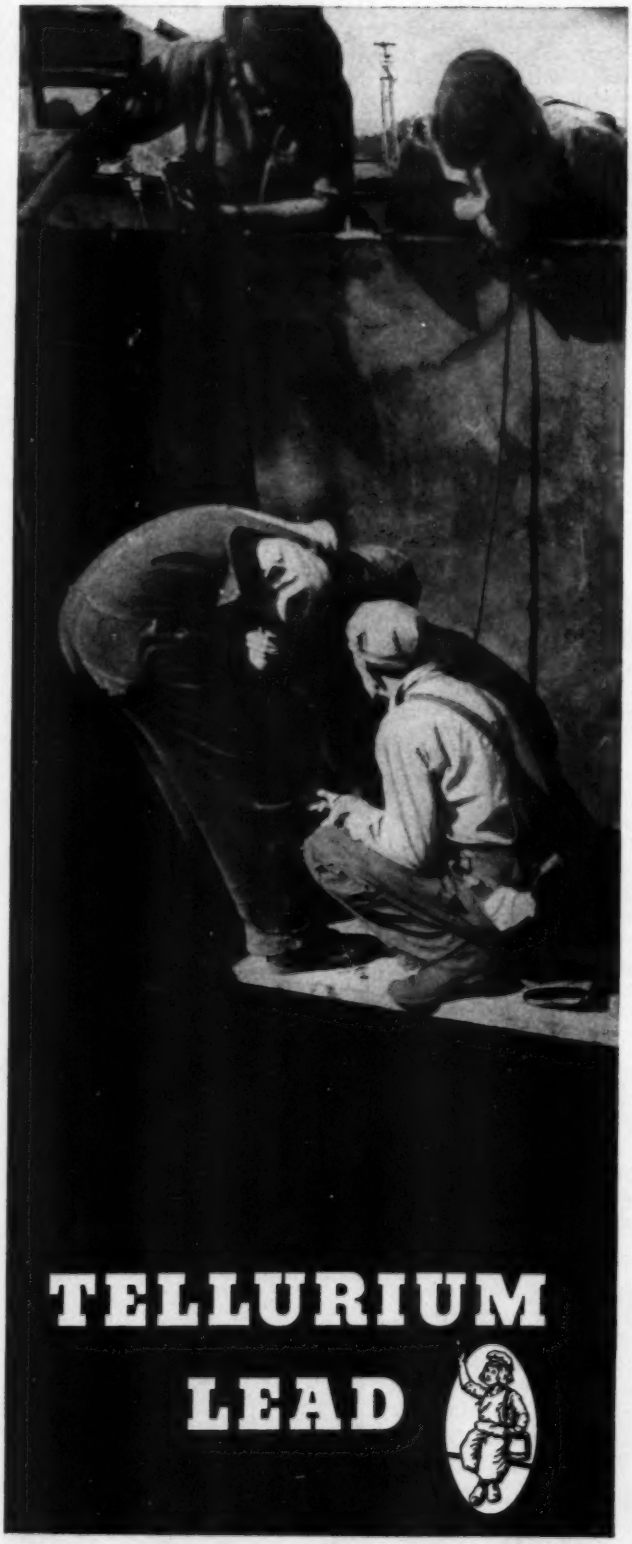
MARTWICK NOW A VICE PRES. OF FOSTER WHEELER

W. L. Martwick, associated with the Foster Wheeler Corporation since its inception in 1927, has been elected vice president in charge of sales, it was announced recently.

Mr. Martwick graduated from Haverford College and was for some time president of the Aero Pulverizer Company which was later absorbed by the Power Specialty Company. The Foster Wheeler Corporation was formed as a consolidation of the Power Specialty Company and the Wheeler Condenser and Engineering Company. Prior to his recent appointment Mr. Martwick was general sales manager.

◆

▸▸▸ Two promotions in the executive staff of the Mathieson Alkali Works have been announced recently. *George W. Dolan,* formerly assistant to President E. M. Allen, has been elected a vice president and *C. S. Glenn* has been elected to a similar post. Mr. Glenn will retain his title of director of operations.



CURBS CORROSIVE ACIDS

You know what a curb bit does to an unruly horse—gentles it—helps bring it under control.

Tellurium Lead has the same effect on corrosive acids. From many different industries come user reports telling how this lead has subdued trouble-making acids—reports which state that Tellurium Lead has prolonged the life of equipment, even when the temperature has approached the melting point of the metal.

Another highly important property of Tellurium Lead is this: *It toughens under stress.* When rolled, stretched or hammered, it actually becomes stronger. As a result, turnover points and joints are less subject to cracking. Furthermore, where vibration occurs, this capacity to develop latent strength minimizes buckling and creeping. It also gives Tellurium Lead improved resistance to fracture due to repeated heat changes.

Tellurium Lead of our manufacture is time-tested St. Joe chemical lead alloyed with a small quantity of tellurium. It gives the advantages of this well-known chemical lead plus important new ones. Yet now it costs only a fraction of a cent more per pound than chemical lead. Available in sheets, pipe and coils. For further facts, write our nearest branch.

NATIONAL LEAD COMPANY

New York, Baltimore, Buffalo, Chicago, Cleveland, Cincinnati, St. Louis; National-Boston Lead Co., Boston; John T. Lewis & Bros. Co., Philadelphia; National Lead & Oil Co., Pittsburgh; Georgia Lead Works, Atlanta; American Lead Corp., Indianapolis; Master Metals, Inc., Cleveland; The Canada Metal Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver.

SKF PRESIDENT SPEAKS BEFORE PUBLICITY GROUP

Guest speaker at a luncheon held in New York City on May 15 by the Technical Publicity Association was William L. Batt, president of SKF Industries, Inc. The luncheon was held in connection with a celebration of the Association's 35th anniversary. Mr. Batt addressed the luncheon group on "Industry's Selling Job" and stressed the necessity of business retaining leadership.

William L. Batt

The theme of the conference was "How Industrial Advertising Can Reduce the Cost of Selling" which was discussed from four different points of view at seminars conducted by Charles McDonough, Combustion Engineering Company, Inc.; W. V. Merrihue, General Electric Company; C. C. Chamberlain, Jenkins Brothers, and R. A. Wheeler of the International Nickel Company. The Technical Publicity Association is the oldest and largest chapter of the National Industrial Advertisers Association.

◆

DEDICATE BRONZE MEMORIAL TO DOUGLAS MALLOCH

The Granville Avenue Methodist Church, Chicago, held dedicatory services Sunday, May 19, of a fitting memorial to the beloved American poet, Douglas Malloch.

This church, known as "The Country Church in the City," is located just a few blocks from the Malloch home in Chicago, where Mrs. Malloch still resides. The memorial which was dedicated in the church's "Garden of Memory," is in the form of a bronze plaque in a setting of weathered stone and pine shrubbery. On it are inscribed "In memory of our beloved American poet, Douglas Malloch," followed by one of Malloch's poems:

"Four things I think make life worthwhile;
To love, to hope, to help, to smile."

The young people of the church have set aside a room in which will be displayed the poems, pictures and clippings on the life and works of the poet. (Mr. Malloch's obituary appeared in the July, 1938 issue of P. I. and P. W.)

◆

▶▶▶ The Wardlow-Thomas Paper Company, Middletown, Ohio, announces the appointment of *Wm. B. Darling* as sales manager. Mr. Darling leaves his connection with the Munising Paper Company to accept his new connection.

◆

MORGAN HEADS YALE & TOWNE PHILA. PLANT

James C. Morgan, formerly general sales manager of the Yale & Towne Manufacturing Company's Philadelphia division, is now general manager of the entire Philadelphia plant, it was announced recently.

Mr. Morgan first became associated with the Yale & Towne organization in 1920. While in charge of the company's electric truck sales he laid the groundwork for the manufacturing and sales methods now used by the company. After becoming assistant to the president he was made manager of the Philadelphia division.

◆

▶▶▶ *B. M. Thomas,* formerly associated with the Container Corporation at Manayunk, Pennsylvinia, is now plant manager of American Coating Mills, Inc., Elkhart, Indiana. Mr. Thomas has supervision of the company's board mill, folding carton plant and corrugated container plant.

◆

▶▶▶ *Frank Murphy,* for many years with the New York office of the Kimberly-Clark Company and affiliated companies, has joined the sales staff of Beach and Arthur. The latter concern plans to enter into the production of specialties in addition to its former line of sulphite papers.

◆

▶▶▶ Appointed manager of the Allis-Chalmers Manufacturing Company's district office at Dallas, Texas, is *A. I. Richardson,* who was previously located at Charlotte, North Carolina. Mr. Richardson, a native of Texas, has been associated with Allis-Chalmers since 1925.

DU PONTS RESIGN EXEC. OFFICES

Pierre S. du Pont retired as chairman of the board and Lammot du Pont resigned as president of E. I. du Pont de Nemours and Company at a recent meeting of the board of directors. Lammot du Pont was elected chairman of the board and Walter S. Carpenter, Jr., a vice president, was made president of the company. Irenee du Pont, a former president of the company, resigned as vice chairman of the board. He, as well as Pierre S. du Pont will continue as members of the board and of the finance committee on which Lammot du Pont will also serve.

In resigning as chairman of the board Mr. du Pont completed almost fifty years of service with the company. Lammot du Pont spent almost all his business life in the service of the company, becoming president in 1926. Mr. Carpenter, the new president, has been associated with du Pont since 1909.

◆

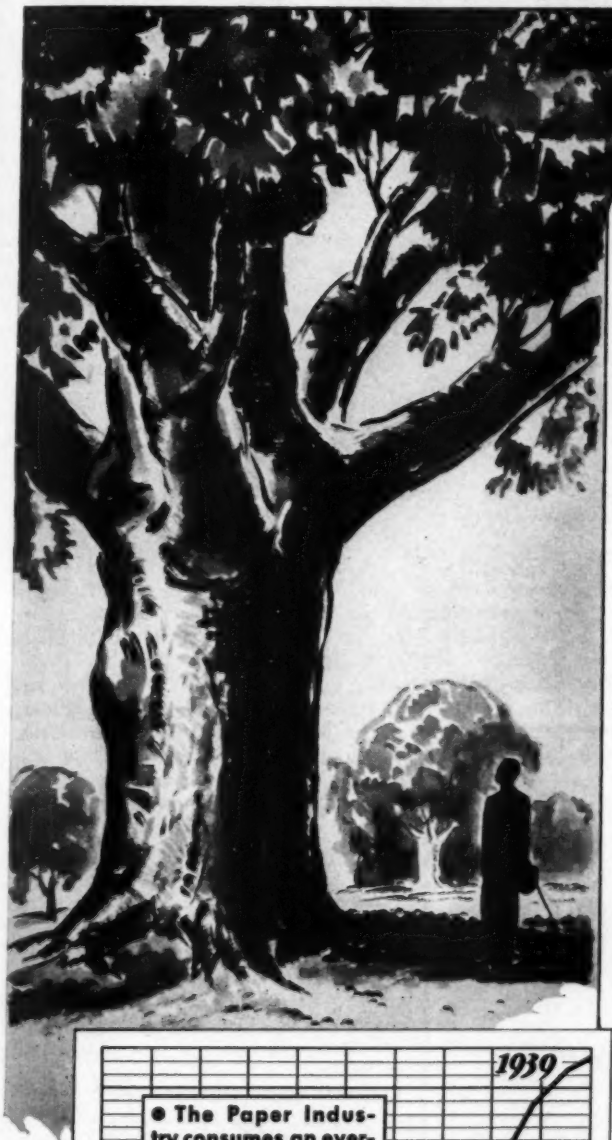
GIBB IS SALES MGR. OF YALE & TOWNE

Now general sales manager of the Philadelphia Division of the Yale and Towne Manufacturing Company is S. W. Gibb, who has been associated with the materials handling organization for twenty years. Mr. Gibb succeeds James C. Morgan who has become general manager of all Philadelphia operations.

S. W. Gibb

Mr. Gibb joined the Yale and Towne company in 1920 as district sales manager. In 1929 he was promoted to Pacific Coast sales manager and in 1931 he became assistant sales manager for the entire materials han-

OPACITY • WHITENESS • BRIGHTNESS



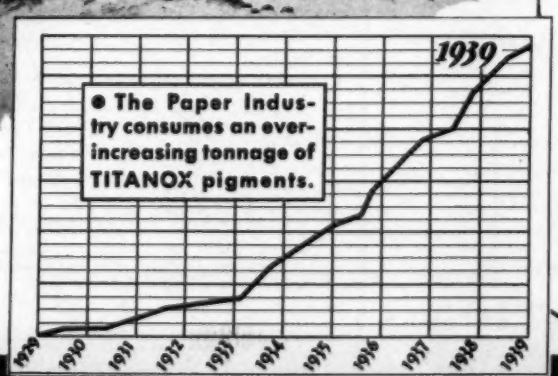
The ACORN is now a MIGHTY OAK

What better measure could there be of the value of TITANOX in the pigmenting of paper than the enormous volume of it consumed annually in the paper industry and the great number of consumers?

And all this has resulted in a short decade. Ten years ago paper manufacturers were experimenting with TITANOX pigments. Today, excepting for the paint industry, they are the largest users.

The reason for this success is apparent. TITANOX pigments have justified every claim made for them. They have established leadership in quality and service. They have aided the paper industry efficiently in its efforts to improve its various products through opacity, whiteness and brightness.

Technical paper problems are welcomed by our Service Department whose cooperation is based on wide experience.



TITANIUM PIGMENT CORPORATION

SOLE SALES AGENT

111 Broadway, New York, N. Y.; 104 South Michigan Ave., Chicago, Illinois; National Lead Co. (Pacific Coast Branch), 2240 24th Street, San Francisco, California.

TITANOX

TRADE MARK

dling division in Philadelphia. His present promotion comes as a fitting reward for the record he achieved in that position. In his nine years as assistant general manager Mr. Gibb established the country-wide Yale distributor organization. One of the main responsibilities of Mr. Gibb's new position will be the maintenance and continued improvement of that organization.

Necrology

OTTO H. FALK

One of the most well known figures in industrial circles as well as civic and military fields, General Otto H. Falk, chairman of the board of the Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, passed away May 21. He was 74 years of age.

General Falk was born in Milwaukee on June 18, 1865. He became associated with military affairs early in life and was cited several times for his work, while adjutant general of the state militia. The most conspicuous work in connection with his business life was his re-organization of the old Allis-Chalmers Company into the present concern. He was made receiver of Allis-Chalmers in 1912 and about a year later was made president of the re-organized company. Some years ago he was elected board chairman.

Gen. Otto H. Falk

In addition to these duties, General Falk was a director in numerous other companies and was actively interested in philanthropic work. He was also active in educational fields, being a regent of Marquette University, a life member of the Wisconsin Historical Society and an honorary member of the Burgessess Corps, New York.

Surviving General Falk are his widow, one daughter, a son and a brother.

◆

MYRON T. RAY

Myron T. Ray, known throughout the paper industry as "M. T.", passed away suddenly at his home at Lake Winnebago, on May 23. Mr. Ray, associated with the Thilmany Pulp and Paper Company at Kaukauna, Wisconsin, since 1920, was secretary-treasurer of the company. For several years he was a member of the executive committee of the Wisconsin Traffic Association and was active in several industrial and civic organizations in Appleton and Kaukauna. He is survived by his widow and two daughters.

◆

▶▶▶ *Fred W. Brawn,* who retired in 1927 after many years of service with various paper mill organizations, passed away May 17 after a year's illness. Mr. Brawn's paper mill career began in 1880 when he joined the Hollingsworth and Whitney Company at Gardiner, Maine. Subsequently he as was associated with the Richards Pulp and Paper Company, at Gardiner; the H. and W. mill at Waterville, Maine; The Brown Company, at Berlin; the Fraser Companies at Edmundston, N. B., and the Nashwaak Pulp and Paper Company at Fairville, N. B. He resided at St. John, N. B. Surviving Mr. Brawn are two sons and one daughter.

◆

▶▶▶ *Edward T. Kline,* resident manager of the new pulp mill of Rayonier, Inc., Fernandina, Florida, was fatally injured in an automobile collision recently. *Mrs. Kline* was also fatally injured.

Mr. Kline entered the pulp industry in 1930 when he joined the staff of the Olympic Forest Products Company at Port Angeles, Washington, eventually becoming assistant manager of that plant. Three years ago he was transferred to the company's Seattle office and was sent to Fernandina shortly thereafter.

◆

▶▶▶ *John W. Irvine,* superintendent of the Pittsburgh Piping and Equipment Company, Pittsburgh, passed away May 25 at his home in Pittsburgh. Mr. Irvine was one of the original employees of the company when it was founded thirty-seven years ago. Mr. Irvine had been superintendent for the past fifteen years.

COTTRELL PROCESS OF
ELECTRICAL PRECIPITATION

universally recognized as a
standard method of removing

DUST, FLY ASH, FUME, MIST & FOG
from GASES

●

28 years of research development and operating experience by the affiliated Cottrell Companies throughout the world is incorporated in the

COTTRELL INSTALLATIONS

offered to meet the requirements of any problem by

RESEARCH CORPORATION

405 LEXINGTON AVENUE
NEW YORK CITY

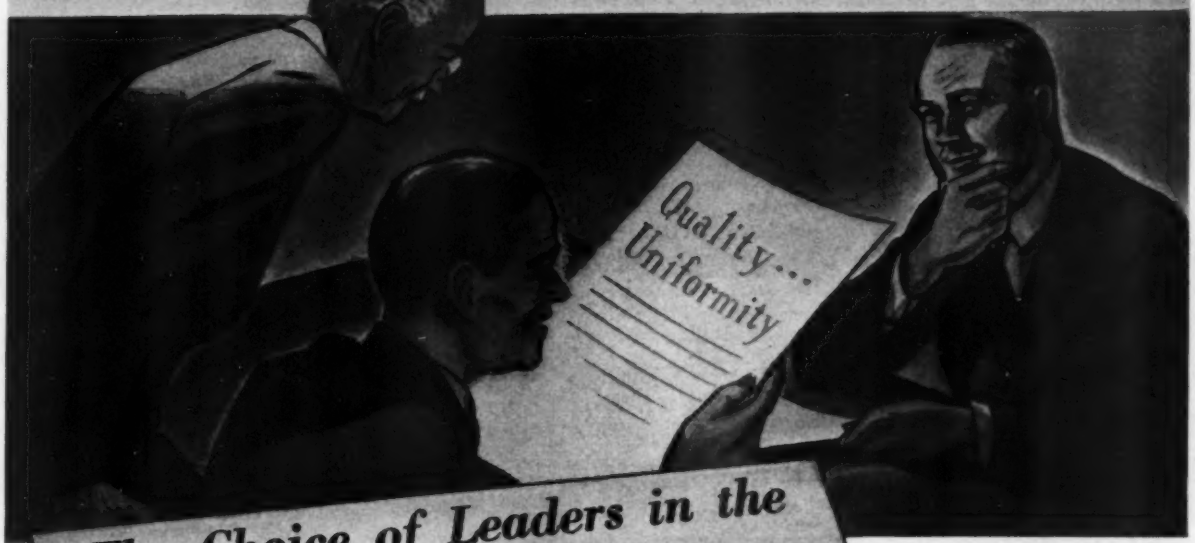
59 EAST VAN BUREN STREET
CHICAGO, ILL.

associated with

WESTERN PRECIPITATION CORP.

1016 W. 9th St., Los Angeles

DU PONT CHEMICALS for paper manufacturers



The Choice of Leaders in the Paper Industry

SPECIFY DU PONT CHEMICALS ON YOUR NEXT ORDER

- Acetate of Lead
- Aluminum Sulfate Commercial, Iron Free
- Aqua Ammonia
- Barium Carbonate
- Barium Chloride
- Barium Sulfate (Blanc Fixe)
- Bleach
- Caustic Soda
- C. P. Ammonium Hydroxide
- C. P. Hydrochloric Acid
- C. P. Nitric Acid
- C. P. Sulfuric Acid
- Muriatic Acid
- Salt Cake
- Silicate of Soda
- Soda Ash
- Sulfuric Acid
- Tri-Sodium Phosphate
- Tetra Sodium Pyro Phosphate

Knowledge gained through many years' contact with the paper industry has resulted in a line of acids and processing chemicals particularly adapted to paper makers' requirements.

Backed by the research of Du Pont laboratories and produced under rigid manufacturing control, Du Pont Chemicals are an assurance of quality and uniformity in paper making.

AT YOUR SERVICE

Our Technical Service Department may be of help in solving some of your problems. This service is available to you.

DU PONT

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
GRASSELLI CHEMICALS DEPARTMENT
WILMINGTON, DELAWARE

Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit • Los Angeles • Milwaukee
New Haven • New Orleans • New York • Philadelphia • Pittsburgh • Rensselaer • San Francisco • St. Louis • St. Paul
Represented in Canada by CANADIAN INDUSTRIES, LTD., General Chemicals Division, Montreal and Toronto

ADVERTISING PAGES REMOVED

Convention Papers . . . Abridged

The Psychology of Color

I. H. GODLOVE and E. R. LAUGHLIN
E. I. du Pont de Nemours & Company, Inc.

Properly speaking, the whole subject of color is embraced in the psychology of color, when color is defined as it has been for centuries; for color is a matter of sensation and perception, which is the province of psychology. It is only when, in our thinking about color, we feel the need of tying it to our physical concepts of objects, molecules, wave lengths and intensities, that we are forced to go into the physics of color. In particular, when we require accurate measurement, we must consider the physics of color.

In practical colorimetry, because of the difficulty of accurate measurement of sensations, we measure instead equivalent stimuli. In one method of colorimetry, sometimes called "trichromatic analysis," we match the sample color-stimulus by three mixed "primary" stimuli. A specification of the color is obtained in terms of the relative amounts of the three primaries expressed as "trilinear co-ordinates," x, y and z; and with these one measure of intensity or brightness. Lack of time requires omission of another method of colorimetry. Both belong in a category which is neither objective nor subjective, neither purely physical nor purely psychological. They are a part of the intermediate field of *Psychophysics*.

A large number of the papers presented at the annual meeting of the Technical Association held in New York City, February 19-22, 1940, have been digested and regular installments will be published until all are presented. Some of these abridgments have already appeared in the March, April, and May issues.

When we have completed the correlations of color and its physical stimuli, and the analysis of color into its attributes, we find that we do not have the whole story. Besides the physical quantities we have already mentioned, we must specify certain physical conditions, as angles of illumination and viewing of the sample; also the condition of the eye of the observer, not only at the moment of viewing the sample but for some time previous to this. This state of "adaptation" of the eye depends chiefly upon the reflectance of the background of the sample and upon the type of illumination, and to a lesser extent upon the intensity of the illumination. Obviously, an object which in neutral light appears violet, may appear red when seen lighted by a source having an excess of red-generating waves, as an incandescent light; and it may appear blue in the light of a clear blue sky. A related effect is that familiar objects seem to hold tenaciously to their so-called "true colors" in spite of changes of illumination which must make the light stimulus reaching the eye from the object very different. A red cherry is red in bright sunlight or in twilight, in blue sky light or in orange candle light, even though the physical energy reflected, wave length for wave length, to the eye, varies greatly in composition. We see the leaves of a book as "white," whether the light reflected from it is the orange light of a candle, the green-yellow light in the woods, or green light from a lamp shade of that color. We think of white objects as reflecting all of the light that strike them, and black objects as reflecting none; but a shadowed white paper is still "white" when it reflects only one per cent of the light that it would under strong illumination. Also, it is said to be "white" when the light reflected is no greater than that from a piece of black velvet when the latter is strongly illuminated. But there is work to show that if these are seen under conditions such that the objective situation is not known, the effect disappears. For example, if the paper is weakly illuminated and the velvet strongly lighted and the two seen through two holes in a screen, they may appear to be grays of equal brightness. Some scientists explain the "color constancy" of the objects of vision as resulting from the mechanism of perception. The impression produced in consciousness by a color stimulus is thought to depend to a marked extent on our knowledge of the objective situation, the brain having an astonishing capacity to reconstruct color perception from the immediate sensations on the basis of remembered colors.

Professor Helson of Bryn Mawr, a psychologist who has collaborated with the physicist Judd, has done some important work which also stresses the importance of the level of reflectance to which the eye is adapted. This depends chiefly on the reflectance of the background. Working with non-selective samples, he found that ones lighter than the adaptation reflectance are seen of the hue of the illuminant, objects darker than the adaptation reflectance have the hue complementary to the hue of the light source, and objects having a reflectance near the adaptation reflectance are nearly or quite without hue. The concept of color constancy is to a certain degree a concession of the psychologist to the common sense view; he rationalizes this admission by attributing the fact, that the cherry is seen as red in nearly all ordinary lights, to memory of the cherry color or to certain perceptual factors. Helson and Judd now find that there is constancy of color only when the illumination is very homogeneous, or the object very selective, or when the reflectance of the object happens to be the same as the adaptation reflectance, which depends chiefly on the background. Mere change in background is sufficient to change the color; a medium gray seen on a white ground in red light appears blue-green, while on a black ground it will look red. Thus again the hard facts of experiment get us further away from the common sense view of the color as belonging to the object.

When a stimulus reaches the eye, its response, the color, does not reach its final value instantaneously. It requires a definite time to reach equilibrium. By adaptation we mean the relatively slow process by which the eye accommodates itself to changes of light intensity or quality by changes in its sensitivity. Getting "accustomed to the dark" is an adaptation to change of intensity; the changes occuring when colored glasses are put on are an adaptation to change in the spectral character of the illumination. Adaptation is essentially a retinal process.

In the time interval preceding final equilibrium, effects known as "after-image" and "contrast" effects occur. They are positive and negative effects in time and in space, respectively. Adaptation generally causes color changes which tend to counteract the initial changes due to a given stimuli. Colors are desaturated on dark adaptation or on adaptation to strongly chromatic illumination. If only a portion of the retina is stimulated, the reduction of saturation for a corresponding stimulus is accompanied by an increase of saturations due to all other stimuli; so we get the complementary after-image.

Simultaneous contrast is a reciprocal alteration of adjacent colors in such a direction as to increase the difference which would have existed between them without contrast. Contrast causes colored areas to look lighter on dark backgrounds, darker on bright backgrounds. The chromatic contrast is greatest when the brightness contrast is least, the general effect being toward a complementary hue.

This "killing" of one color by contrast with another color occurs only too commonly in advertising, and often in the coloring of products and in decoration. A careful consideration of possible contrast effects will not only prevent such tragedies but will suggest desirable enhancing effects. A great deal of what artists call "vibration" or "life" in paintings is due to deliberate or inadvertent use of felicitous contrasts.

The subject of illusions is a very interesting one. Briefly, we find that vertical lines look longer than objectively equal horizontal ones; of two similar figure components, uppermost ones look larger than lowermost ones; a figure length embracing more details or features looks shorter than a less complex length without detail. Turning to illusions involving color, after-images and contrast effects might be broadly so considered. Others are due to defects of the eye considered as an optical apparatus. One of these, called "chromatic aberration," is exemplified in the appearance of red and violet fringes along the edges of a very bright white object seen against a white back-

When You're Cramped for Space

USE THESE VERY LIGHT INCH SERIES BEARINGS

Having bores abnormally large, as compared with the outside diameter, they offer the engineer such important advantages as *compactness, light weight and greater latitude in design.*

They are available in the "S" and "XLS" ball bearing series, the former starting at ⅛-in. bore and the latter at 1⅜-in. bore, the complete range running up to 21-in. bore and 28-in. O. D. And there is the "RXLS" series extra light roller bearings, paralleling the "XLS" in size range.

Why not let our engineers tell you more about these Very Light Precision Bearings?

Write for the Catalog, which describes 108 distinct series of PRECISION Bearings, embracing over 3,000 catalogued sizes.

"NORMA-HOFFMANN"
PRECISION BEARINGS
BALL, ROLLER AND THRUST

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

ground. The blue and violet haze which hangs about mountains is due to scattering of light by very small particles.

Certain color problems involve a combination of physical, physiological and psychological factors such are the problems of legibility of colors on various backgrounds, and problems of eye-strain and fatigue. We frequently hear that "green is easy on the eyes." But what is in fact the best light? Yellow-green light gives the greatest brightness for a given amount of energy in the stimulus; and we shall see that in certain experimental work, green was found only moderately good and fatiguing. Here "fatigue" means an increase of ache in the muscles which move the eye; it is not a matter of tiring or damaging the sensitive surface. Within ordinary illumination limits, the retina is not subject to fatigue of that sort. Continued stimulation causes the changes already discussed as adaptation, after-images and contrast effects.

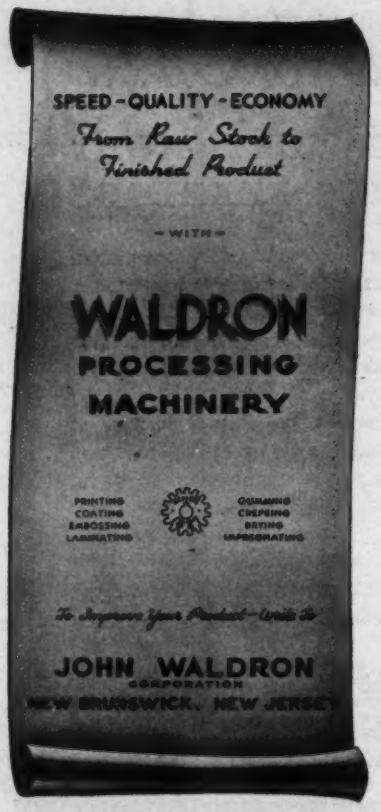
Legibility, although it is of great importance in reading billboard advertising, road signs and automobile license plates, can be most conveniently studied in relation to the reading of writing on paper. The outstanding fact on which all agree is the necessity of sufficient contrast (but possibly not too much) of the paper and printed matter. Of the contrasts, certainly the brightness contrast is the most important. Remember here that our "brightness" is not the same attribute of colors as the one called by that name generally in the dyestuffs industry; we mean, in the case of colored paper, the lightness or darkness, which corresponds to the relative amounts of light reflected. The brightness difference should be as great as is practicable. Since inks are usually dark, the paper must be light.

Closely related to legibility is the subject of the attention-getting value of colors considered apart from their pleasantness. Work by Gale and by Adams found the attention-attracting value of black, red and orange high, and yellow and violet low, on a white background. Probably these results could be predicted from the various contrasts obtainable when using the various commercially obtainable printing inks. It must be remembered that colors may be a distraction; for example, a too-saturated background may get attention and divert it at the expense of the advertising message. Also, a saturated red and yellow combination may do very well on a gas station or a five-and-ten store, but not so well for other purposes.

In the psychology of color and its applications we must include the broad field of "color preference," the appropriateness of colors and "color harmony." Various authorities contradict each other as to the preferences of men and women, or both together; and some state different preferences when the attributes other than hue are equalized and when they are not equated.

If we note the lightness of a series of common pigments or dyeings of 20 successive hues at their lightness levels of greatest saturation, or observe light spread out into a spectrum, we find a "Natural Sequence," beginning with yellow and proceeding through green, blue, purple, and red and back to yellow. The lightness goes down toward the greens, is lowest at purple-blue, and comes up again through red to yellow, in a broad V-shaped series. Any sequence of hue and lightness or darkness opposite to this "natural" sequence, as dark green-yellow and light blue, is an "unnatural" sequence. It was found, in experiments using art students as observers, that practically all the harmonious pairs of colors are in natural sequence; and nearly all the color pairs in unnatural sequence are bad.

Another interesting field of color psychology is that called "chromo-therapy," a real or alleged healing by colored light, including the cure of mental cases. It must be remembered that light, when absorbed, induces chemical reactions or is converted into heat. Such reactions are responsible for sun tanning, erythma, the destruction of bacteria and the stimulation of the nerve endings in the skin which increases resistance and heightens the general tone. Effects claimed for red light may be chiefly due to the infrared or heat rays of slightly longer wave length; and effects claimed for blue or violet may be due to ultraviolet, which is very active chemically. That the effects vary quite specifically with wave length is highly doubtful, except for two general variations with wave length which are opposite in sense: (1) The photochemical efficiency of light for most reactions increases with decreasing wave length, becoming great for ultraviolet; (2) the ability to penetrate tissues increases with wave length, so that only infrared and red may be considered penetrating.



An Investigaion of the Coloring Matter of Sulphite Liquor*

LINTON E. SIMERL
The Mead Corporation
Chillicothe, Ohio

This research had three objectives: (1) to determine the nature of the coloring matter in sulphite liquor throughout the cook; (2) to furnish information on the rate and mechanism of the reaction of the cooking acid on wood; and (3) to develop the fundamental basis for scientific cook control by photoelectric instruments.

The color of sulphite liquor is almost universally used in cook control, but only as a corroborative test. The most common variable and the one by which the sulphite cook is easiest controlled is time.

The determination of the cooking end point with time as the variable is possible by any one of a half dozen methods, and of these the determination of the permangenate number is probably most satisfactory.

By far the most commonly examined property of the liquor is the color. Practically every mill checks the color and depends upon it more or less.

This investigation was divided into three phases: *(a)* analysis of liquor from small scale cooks in an effort to correlate the percentage of chromophoric constituents with the depth of color; *(b)* the isolation of all the wood constituents and the individual digestion of them in order to determine the color produced by each; and *(c)* the determination of the effect on color of the major commercial variables, the wood species, and the temperature schedule.

The first phase, the correlation of percentage of chemical constituents with the color of the liquor during the course of the cook, was carried out on samples from semi-commercial cooks of spruce.

Indications of the first phase of the work, are that from zero to three hours the color of the liquor is due to water-soluble material and, to some extent, to lignin. From the third to the seventh hour the color is practically all due to the calcium lignosulphonate in solution, and above the seventh hour, after a temperature of 140 deg. C. has been reached, to carbohydrate degradation material. The lignin color contribution in this last stage is slight compared to that of the burned sugars. The character of the liquor color (hue) changes in the course of the cook, corresponding to the above theory of the course of the dominant chromophoric material present at any stage in the cook.

Proof of the above theory that the great increase of color in the last stage of the cook is due to the degradation of carbohydrate material, and not to lignin, was based on several additional experiments. The first of these was the heating of isolated liquors at 140 deg. for further periods. These isolated liquors were free from any effect of further increase in lignin and carbohydrate content which would result if chips were present.

The color increased 4600 per cent on heating ten-hour liquor an additional six hours, whereas the sugar content decreased 44 per cent and the lignin content decreased only 4.7 per cent. It is evident that calcium lignosulphonate is relatively stable to acid and high temperature, while the sugar is being degraded (carmelized) to highly colored material. Further work was done on this point in the second phase of the investigation, in which all of the components of wood were cooked separately.

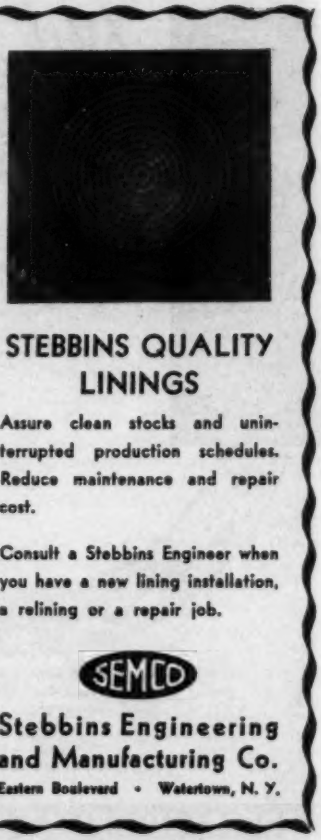
A few observations were made during the previous experiments on the procedure used for sugars and lignin determination in sulphite liquors. The problem was separation of lignin and carbohydrates and the coloring matter associated with each, and the quantitative determination of each. Two quantitative analysis procedures were used for these liquors, the weight of the benzidine precipitate, which gave too low lignin values, and the total methoxyl content of the carefully dried solids of the liquor, which gave too high lignin content, since only about 87 per cent of the methoxyl content of sprucewood is in the native lignin. However, the results from the two procedures always agreed in trend, and it is believed that the lignin determination in sulphite liquors is best made by these analyses.

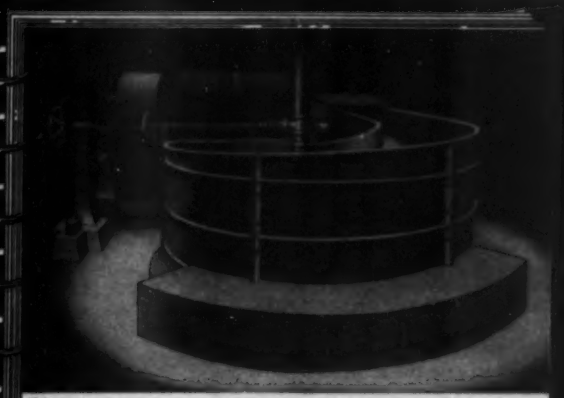
Two determinations were also made of the reducing sugar content of the liquor, the first on the raw liquor (the only one necessary), and the second on the filtrate from the benzidine precipitation procedure, on liquor from which practically all of the lignin had been removed. This latter figure averaged from 95 to 100 per cent of the first, and the loss was attributed to mechanical absorption and occlusion of sugar in the flocculent lignin-benzidine precipitate. All the evidence obtained agreed that calcium lignosulphonate as it exists in normal sulphite liquor does not reduce Fehling's solution and therefore does not interfere in the sugar analysis of the raw liquor. The sugar solution remaining after removal of the benzidine lignin precipitate contained most of the coloring matter of the degraded carbohydrate material, but the benzodine precipitation did not effect a quantitative separation of the lignin and caramel coloring materials. The amount of degraded carbohydrate material absorbed or held by the benzidine precipitate depended upon the degree of the liquor degradation.

In the optical analysis of the liquor the effect of age, pH, and dilution were determined. Aging tests up to seventy days indicated that no change in color occurs in this period, but another test indicated a slight increase in color. Calcium sulphite settles out of these samples, the reducing sugar content decreases greatly, and the methoxyl content drops, but the color is very stable.

The effect of pH on color was investigated on sulphite waste liquor and on the two major chromophoric constituents, calcium lignosulphonate and caramel, by addition of acids and alkali and measurement of the resulting spectral transmittance. The color of all three substances is not affected by acidity below pH 3.0. The depth of color of all three substances increased with addition of alkali, the increase amounting to 600 per cent for sulphite waste liquor but only 200 per cent for isolated calcium lignosulphonate and sucrose caramel. A remarkable color shift or indicator action took

*A portion of a thesis submitted in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Doctor of Philosophy from Lawrence College, Appleton, Wisconsin, June, 1939.


STEBBINS QUALITY
LININGS
Assure clean stocks and uninterrupted production schedules. Reduce maintenance and repair cost.
Consult a Stebbins Engineer when you have a new lining installation, a relining or a repair job.
SEMCO
Stebbins Engineering and Manufacturing Co.
Eastern Boulevard • Watertown, N. Y.



DILTS HYDRAFINER

This high speed, compact, precision-built unit utilizes the principle of close clearances and high surface speed for producing the refining action. Its efficiency and economical operation reflect the skillful designing and engineering for which all Dilts equipment is noted. The unit may be used as an adjunct to or as a definite part of your present equipment in continuous or batch operation.

All Dilts stock preparation equipment is built with a background of more than 70 years' experience in the paper making industry.

DILTS BEATER EQUIPMENT

Scientific engineering is of utmost importance in the designing and production of beaters and their parts. The name DILTS is always associated with efficient beating equipment because wherever Dilts systems or units are in use, they are delivering a plus-service.

When in need of beaters; banded or bandless rolls; washers; lighter stands; packing boxes or other parts, let us quote you on your requirements. If you are not familiar with the Dilts Hydraulic Quick-Release for beater rolls, you may be interested in the details. Write us for information.

Dilts

DILTS MACHINE WORKS INC., Fulton, N. Y.

Dilts

● How effective is your Safety Program?

● How do your accident frequency and severity rates compare with those of similar plants?

● What was the industry's experience as a whole during 1939?

These and hundreds of other questions are answered in the NEW

ACCIDENT RATES PAMPHLET

for the

Paper and Pulp Industry

A copy of this pamphlet will be sent FREE to any plant safety Director or Executive on request. Just drop a line on company letterhead to PAPER and PULP SECTION.

National Safety Council Inc.

20 North Wacker Drive Chicago, Illinois

PARAFFINE WAX EMULSIONS

Paraffine Wax Emulsions may be produced *spontaneously*, easily and without the need of costly equipment, through the use of NOPCO 2251—a new departure in wax emulsifiers.

NOPCO 2251 will carry the greatest amount of wax consistent with good emulsion stability and contribute maximum sizing efficiency to the wax.

Write for sample and Technical Bulletin

NOPCO
EVOLVED THRU RESEARCH

National Oil Products Co.

Harrison, New Jersey
Boston · Chicago
Cedartown, Ga. · Los Angeles

PULP BLEACHING COMPANY

■

WAUSAU
WISCONSIN

■

CELLULOSE PURIFICATION

place with the addition of alkali to sulphite waste liquor and to the lignin compound, but not with caramel.

In some cases the liquor samples were very deeply colored and dilution was necessary to determine spectral absorption. Water was the most satisfactory diluent found, although the colors obtained were in error both in intensity and hue. The changes resulting from dilution with dilute hydrochloric acid and with fresh sulphite acid were even more in error, indicating that pH alone is not the cause of the changes and that the specific acid used is important.

The second phase of the investigation was the isolation of all of the wood components, and cooking of them with sulphite acid in sealed test tubes at a 50:1 liquor ratio. Certain other sugars, lignin compounds, and related substances were also cooked, in order to determine the relative amount of color produced. The total number included ether-, alcohol-, benzene-, and water-soluble materials, raw and extracted woods, holocellulose, hemicellulose, and alkali-resistant cellulose; glucose, levulose, mannose, galactose, arabinose, xylose, cellobiose, and sucrose; three calcium lignosulphonates, two sodium lignosulphonates, and the native lignin of Brauns [Brauns, F. E., *Paper Trade J.* 108, No. 1:42 (Jan. 5, 1939)]; cotton cellulose, corn starch, tannic acid, and lemon pectin.

Black sprucewood meal, 40-65 mesh, was used in the preparation of the isolated wood components.

In cooking the above wood constituents and related compounds, the ovendry equivalent of 1,000 gram of material was weighed and introduced into dry 25 by 250 mm. Pyrex test tubes. Fifty cc. of cooking acid were pipetted into each tube, which were immediately sealed by drawing out in an oxygen flame, leaving approximately equal gas volumes above the liquid. The ether- and alcohol-benzene-soluble portions of sprucewood were precipitated by evaporation of the organic solvent in the tubes, with a gram of asbestos fibre present to provide a large area. The sealed tubes as many as twelve at one time) were placed in a small autoclave, which was filled with water to the level of the liquor in the tubes. The autoclave was sealed and heated in an oil bath, requiring 1.5 hours to reach 140 deg. C. The cooking liquor used was soda base with 1.20 per cent combined sulphur dioxide and 6.20 per cent total sulphur dioxide. The calcium base liquor used for the semi-commercial chip cooking was found to be unsatisfactory because of excessive precipitation occurring on heating, particularly with the sugars. The soda base liquor maintained a relatively homogeneous system inside the tube.

The major wood components—i.e., extracted wood, holocellulose, hemicellulose, alkali-resistant cellulose, calcium lignosulphonate, and glucose—were heated under the above conditions for periods of 5, 8, and 10.5 hours at the maximum temperature of 140 deg. C. The percentage of total sulphur dioxide, the reducing sugar content, and the spectral transmittance were determined on each sample.

The cooking of wood flour under these conditions followed exactly the same course as did the digestion of chips, with corresponding color changes in the liquor.

Of the three cellulose fractions, the hemicellulose was, as was expected, the most sensitive to the cooking action. The resistant cellulose portion showed little change, but the holocellulose fraction, containing the easily hydrolyzable pentosans and hexosans which burned very readily as the hemicellulose fraction, was colored in proportion to the hemicellulose content. For all of these substances, from wood to glucose, the rate of color increase was practically linear with time, over the period from 5 to 10.5 hours, a period in which the sugar content remained approximately constant.

A series of 27 wood components and related compounds were cooked for five hours at 140 deg. C. in order to determine the extent of sulphite acid attack and the relative amount of color produced.

The minor wood extractives, totalling 3 per cent of the total wood, are in general highly colored. The ether-soluble pitch is only slightly attacked by sulphite acid, and the amount of color contributed to the liquor from this source is practically negligible. However, the alcohol-benzene-soluble material was practically all dissolved to give a deep red-brown solution with approximately the color of caramel. The water-soluble portions were colored as isolated and formed deeply colored solutions when cooked.

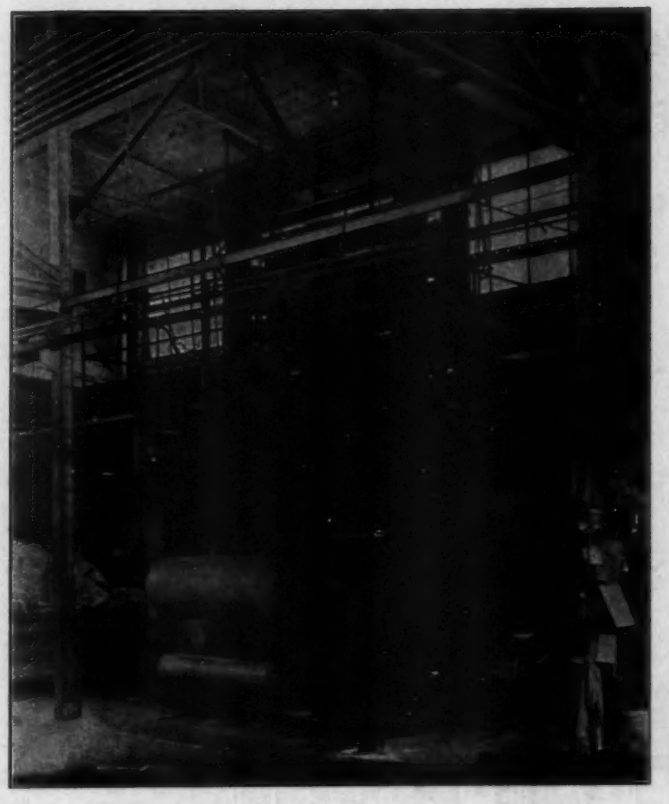
The pentose sugars were much more sensitive to acid degradation than were the hexoses. The sugars in order of the color produced were: xylose, arabinose, galactose, glucose, mannose, cellobiose and levulose. The order of this series was checked by hydrochloric acid degradation. The colors produced were from light yellow to deep red-brown.

The pure cotton cellulose was practically unaffected by the cooking, even less so than the resistant spruce cellulose. Corn starch at five hours was almost completely hydrolyzed, but the potential degradation had only started. Tannic acid and lemon pectin are also easily hydrolyzed to produce high percentages of reducing substances which in turn degrade and produce the characteristic color.

In the commercial production of sulphite pulp the most important factors affecting the color of the liquor are the cooking schedule employed and the raw material, wood, with variations in the wood from one species to another and within a species.

The effect of schedule, pressure, and temperature was studied on a series of cooks made in the small digester used for the first part of this work, the cooks being made by the pulping class of The Institute of Paper Chemistry.

The most significant finding in these experiments was that the yield and permanganate number of a cook are related directly to the liquor color, independently of the cooking conditions. The pressure has been shown to be a major variable in cooking, but here the yield and permangenate number of the pulp and the liquor color of cooks at 75-pound pressure agree with the results of cooks at 100- and 110-pound pressure, with compensating lower maximum temperature. This is the logical result, namely, that the liquor color is a measure



Here Are Two Ways To Save Money With NORWOOD CALENDERS

You can save money and speed up production in your finishing room by replacing old calenders with new, efficient, economical Norwood Calenders . . . or you can step-up the efficiency of your present calenders by adding some of the new time- and money-saving features recently developed by Norwood's engineers.

In either case Norwood will help you turn out a better sheet, in less time, with less broke, and help you to operate more efficiently. Write us today. Tell us the equipment you have and ask how we can help you to operate more profitably.

THE NORWOOD ENGINEERING CO.
16 No. Maple St., Florence, Mass.

A GOOD START AND A GOOD FINISH WITH
NORWOOD
DEPENDABLE WATER FILTERS AND PAPER FINISHING MACHINERY

APPLETON WIRES are GOOD WIRES

APPLETON WIRE WORKS, INC.
APPLETON, WIS.

Of Course You Have Slime Deposits

BUT THEY NEEDN'T BOTHER YOU!

Now and in the hot months just ahead, slime takes its heaviest toll, in needless production of seconds and wasted stock and in needlessly high cleaning costs. You don't have to pay toll to slime.

ASK FOR PERFORMANCE REPORTS

from paper mills where Magnus Slime Remover is being used, describing the results they are getting compared with previous methods.

USE MAGNUS SLIME REMOVER

It ends slime troubles in beaters, stock chests, head boxes, machines and everywhere else in the plant where slime accumulates. It kills bacteria and fungus growths, rendering them non-adhesive. It penetrates, loosens and removes all slime deposits, holding all constituents in a stable, finely divided emulsion that is easily and thoroughly washed away by rinsing.

Don't mess around with hand or any other kind of ineffective cleaning on your slime deposits. Lick your entire slime problem cheaply and thoroughly with Magnus Slime Remover.

MAGNUS CHEMICAL COMPANY

Manufacturers of Cleaning Materials, Industrial Soaps, Metallic Soaps, Sulfonated Oils, Emulsifying Agents and Metal Working Lubricants

192 South Avenue Garwood, N. J.

MAGNUS CLEANERS

of the degree of cooking, independently of the variables in the cook.

The duplicate cooks did not agree in liquor color as well with small scale equipment as they would with commercial equipment. The cooks at excessive conditions were particularly difficult to duplicate because of the extremely rapid color increase at the high temperature range.

The above experimental data indicate how photoelectric color measurements may be used for cook control. The use of a recording spectrophotometer is not necessary; for routine work a monochromatic photoelectric absorption meter should give duplicable results and satisfactory service.

The color of unbleached pulp may come from three sources: *(a)* the residual lignin, *(b)* coloring matter of the wood not removed by the pulping process, and *(c)* coloring matter absorbed from the cooking liquor during the last part of the digestion. The bleaching problem is the removal of all of these.

This correlation between liquor color and color of unbleached sulphite pulps, with the evidence showing the influence of degraded carbohydrate material on liquir color, points to the importance of the condensation products of sugars (caramel) in bleaching. The brown, insoluble resins formed with acid treatment of pentose and hexose material, through furfural and its related compounds, are unaffected by all solvents and cannot be chlorinated and bleached in the same manner in which residual lignin in pulp is removed. The only method of removal from pulp is oxidation (to carbon dioxide and water) by bleach liquor. This can be done but with considerable damage to pulp. A certain percentage of the color of any unbleached sulphite pulp is due to this degraded carbohydrate material.

The problem of bleaching of soda and sulphate pulps may be even more concerned with carbohydrate material than is the sulphite problem. Soda and sulphate pulps are both much more difficult to bleach than sulphite, and the liquors contain roughly fifty to one hundred times as much coloring matter as a sulphite liquor. The colors of alkali lignin, in solution or in pulp, are many times as strong as those of equivalent amounts of acid lignin, but alkaline attack on sugars also produces colors much more intense than acid attack. It is believed that the problem of the determination of the character and relative amounts of coloring material in alkaline liquors should be investigated from the standpoint of the reactions taking place in cooking and in bleaching.

Some of the Effects of the Wettability of Paper Coating Raw Stock

GLENN DAVIDSON

Some time ago the author had occasion to attempt to coat a wet sheet of paper stock containing approximately 70 per cent water. Using a coating color sized with a casein solution made by cutting casein with 8 per cent soda ash and 2 per cent ammonia, it was found that 35-45 lb. casein per 100 lb. clay were required to produce the same bonding of the coating to the sheet that could readily be obtained with 12 lb. casein per 100 lb. clay, if the sheet were first dried to 8 per cent moisture. The uncoated sheet gave a negative test for protein with Delafield's Haematoxylin solution. After coating at 70 per cent moisture content, with a coating color containing 35-45 lb. casein per 100 lb. clay and drying, the body stock appeared to be saturated with protein when tested with Haematoxylin. On the other hand, when the stock was first dried to 8 per cent moisture and then coated with a coating color containing 12 lb. casein per 100 lb. clay the body stock gave a relatively faint test for protein with Haematoxylin, but sufficiently positive to indicate a definite infiltration of casein even deeply into the sheet.

Recently, using a coating color containing 12 lb. casein (cut with 8 per cent soda and 2 per cent ammonia) per 100 lb. clay, we coated a sheet of ordinary coating stock and a sheet of No. 1 hanging stock (a very hard sized sheet) side by side. The coating bonded to the sheet of coating stock excellently but weakly to the hanging stock. After calendering, Case Ink was applied to these two coated sheets simultaneously. The coating on the hanging stock was found to be very much more non-receptive than the same coating on the ordinary coating stock. In fact, we found it necessary to apply to the coating stock a coating contaiining 18 lb. casein per 100 lb. clay to get Case Ink non-receptivity equal to that obtained with the coating containing 12 lb. casein per 100 lb. clay on the hanging stock.

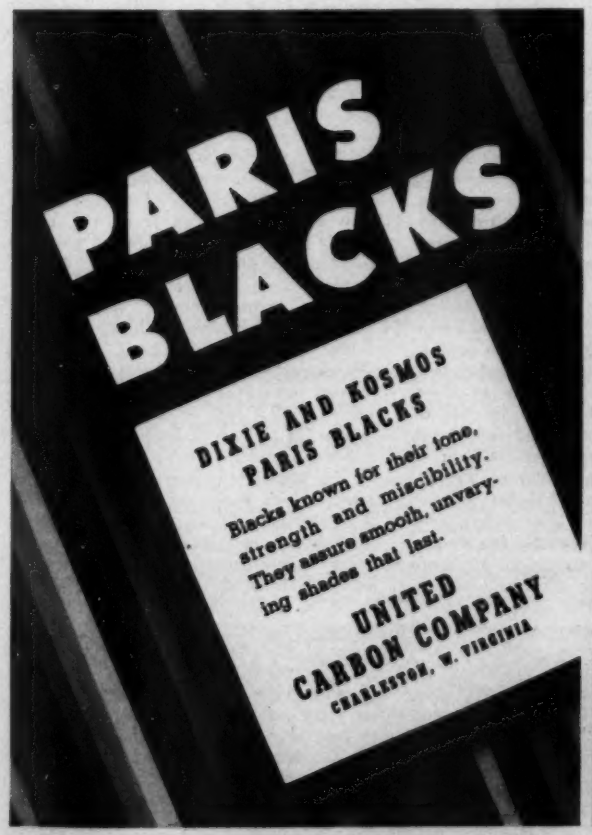
Some months ago, we were working with two coating colors, each containing 12 lb. casein per 100 lb. of clay. One contained casein cut with borax and had a pH of 7.5; the other, casein cut with soda ash and ammonia and had a pH of 9.5. At the time we had on hand, twelve samples of coating stocks secured from almost as many different coating mills. We coated each of these stocks with both of the above colors. The color containing the soda ash cut casein bonded perfectly to all of the twelve sheets The color containing the borax cut casein bonded fairly well to eight sheets and very weakly to the remaining four. The uncoated stocks were all spotted with Universal indicator. The four sheets to which the color containing the borax cut casein bonded weakly appeared to have a pH of 7.0 or slightly above. The sheets to which this color did bond fairly well appeared to possess a pH of below 4.5. One sample each of the stocks to which this color did and did not bond well, were found to be protein-free to Haematoxylin. The protein-free sheet to which the color bonded fairly well showed definite protein coloration with Haematoxylin when tested after coating. When tested likewise, the protein-free sheet to which the color bonded weakly, showed no protein coloration whatever.

We then treated the protein-free stock to which the color containing the borax cut casein bonded weakly with a very light coat of 1 per cent alum solution and dried it. Judging by Universal indicator, it appeared that we reduced the surface pH of this stock to perhaps 3.5. After the alum treatment, the color containing the borax

TROUBLE SHOOTER for Pulp Mills

Connect your drying roll bearings to header lines with Rex-Bellows STAINLESS STEEL EQUALIZERS. Due to bellows construction, these units take axial as well as radial motion; require much shorter lengths to compensate for offset in piping; do away with necessity of looped connections and consequent frequent failures. These Equalizer units have all the qualities of 18-8 stainless steel—corrosion resistance; durability; higher resistance to fatigue, vibration and continued bending movement. Available as straight bellows or in divided bellows form, with circular resistant welded fitting attached as illustrated. Write for information on these time-and-money-saving units.

CHICAGO METAL HOSE CORP.
Maywood, Illinois (Chicago Suburb)


PARIS BLACKS
DIXIE AND KOSMOS PARIS BLACKS
Blacks known for their tone, strength and miscibility. They assure smooth, unvarying shades that last.
UNITED CARBON COMPANY
CHARLESTON, W. VIRGINIA

Skids of paper are no trick at all to load quickly and economically, and ship safely, with the Stanley Car Banding Engineer on the job! See how easily these skids are braced into a single unit – a Stanley Floating Load that's free to shift slightly to absorb impacts without damage! Inexpensive non-skid plates quickly attached to skid runners limit movement of load.

It takes only a few minutes, with Stanley 1¼" Car Banding, the Stanley "G" Tightener and "K" Sealer, to tension them ready to go – a few minutes with low-cost materials, against a few hours with the costly wood bracing formerly used. This paper manufacturer saves time, labor, dunnage, and damage in transit.

Try Stanley Car Banding and you will agree with the Freight and Claims Div., A.A.R., that it offers many advantages. A Stanley Engineer will study your product and shipping requirements and make recommendations without obligation. Stanley Catalog, showing banding tools, and typical applications, free on request. The Stanley Works, Steel Strapping Division, 142 Lake Street, New Britain, Connecticut.

STANLEY CAR BANDING SYSTEM

Stanley Seals give maximum joint strength

STANLEY
TRADE MARK

HIGHEST QUALITY CLAYS

LUMP AND POWDERED } IMPORTED DOMESTIC { CRUDE CRUSHED AIRFLOATED WATER WASHED

PRECIPITATED CALCIUM CARBONATE

cut casein bonded to this stock perfectly. Furthermore, when the alum treated stock coated with the color containing the borax cut casein was tested with Haematoxylin, it showed a definite protein coloration deeply into the body stock.

The above described experiences have been narrated because they are typical of a great variety and number of empirical experiences we have had, all of which lead us to suspect that in commercial coating operations a rather surprisingly large proportion of the total casein in a coating color must traverse the interface between the coating and the body stock in a very short time.

It is a matter of common observation that if a sheet of paper is floated on water, ink or casein size, the upper surface, usually does not become uniformly wet at first.

The lapse of time between the appearance of the first wet spots and complete wetting of the top of the sheet will vary considerably from one sample of paper stock to another. In any event, the author has reasoned that this rather commonplace observation may be connected with some of the important characteristics of the finished coated paper. If the casein from the coating can likewise penetrate into certain small areas of the body stock more rapidly than into other small adjacent areas, it follows that the areas in coating overlying the areas of the body stock into which the casein penetrates most slowly, should contain more casein than the surrounding areas, where the casein can penetrate more rapidly into the body stock. If this is true, it would cause the coating to accept Case Ink unevenly. Further, if in these same areas the casein has been unable to flow from the coating into the sheet sufficiently to re-cement the surface fibers which have been weakened and disrupted by swelling, these areas should be the first to "pick" when the sheet is printed.

The Measurement of the Color of Pulps

R. S. HATCH, Director of Research
Weyerhaeuser Timber Company

Before the advent of physical instruments capable of analyzing color, pulps, both bleached and unbleached, were sold on the basis of samples submitted and visual observation was for many years the only means of judging the color value of a pulp. The first step which was taken to standardize and numerically express the color of bleached pulp was the preparation of a set of standard color wheels made of plaster of Paris to which varying amounts of pigments were added to simulate the different approaches to pure white ordinarily encountered in commercial pulps. These wheels were mounted in a vertical plane, illuminated by a constant source of light and were so arranged that samples of the pulp in question could be placed on one or more of the discs and the whole system revolved at high speed while viewing the samples superimposed on the different discs. The particular disc with which the sample blended and became invisible against the background, determined the numerical color value of the pulp in question.

The next refinement in the measurement of pulp colors was the use of some type of colorimeter in which three primary sources of colored light were reflected from a standard and the sample in question and the evaluation made by means of a split photometric field.

With the development of the photoelectric cell and suitable amplifying system, it has been possible to construct an automatic recording spectrophotometer which is independent of individual observers and capable of completely analyzing any visible color.

Unbleached sulphite pulps are finding considerable use today in mixtures with bleached pulp for many types of papers, and the measurement of color of unbleached pulps is consequently becoming of more importance than it has been in the past. If the papermaker desires to use an unbleached pulp of a given color as a foundation upon which to build the final color of the finished product, the most desirable foundation from which to start is a spectrophotometric curve which will enable him to determine just what effects can be produced with the pulp under consideration. A paper manufacturer who is buying pulp from various sources and wishes to use them interchangeably should have spectrophotometric curves which would show him the color characteristics of the pulps from the various sources. On the other hand, experience has shown that pulp being made by a single mill from a single wood species shows comparatively small variations throughout the reflection factor curve and consequently any day to day variations may be adequately measured by some type of brightness meter adjusted to the most sensitive part of the reflection factor curve. Since 1933, the brightness meter has come into general use in the pulp and paper industry as an instrument for the measurement and control of color. With the modern brightness meter and a suitable series of color filters, it is possible to draw a reflection factor curve which, while not accurate in all regions of the spectrum, may be close enough for comparative purposes provided experience has shown that variations do not occur in those portions of the reflection factor curve where sensitivity is lacking. In research work where the color of unbleached pulps is involved, the only instrument which will give fully reliable information throughout the entire spectrum is, of course, the recording spectrophotometer. If such an instrument is not available to the research worker, then reflection factor curves developed by an abridged spectrophotometer should be checked against a recording spectrophotometer at frequent intervals.

One of the drawbacks to the use of photoelectric instruments for the measurement of color is the presence of foreign matter such as specks of dirt or shives in the sample under examination. When a sample containing a small speck of dirt, for example, carbon, is placed in the field of a sensitive spectrophotometer, the effect of this speck is, of course, to lower the entire curve. If, on the other hand, a speck of dirt is made up of a red shive, as so frequently occurs in unbleached pulp, the effect will not only be to lower the entire curve, but also to change its slope on account of the distinct red color of the shive. It is, therefore, necessary to examine samples with great care before color readings are made, since the dirt component should not be taken into consideration when evaluating color. For certain types of instruments, the surface of the sample is of particular importance, and this will be mentioned when discussing the measurement of the color of bleached pulp.

The manufacturer of bleached pulp endeavors in the bleaching process to remove, as completely as possible, all material of a colored nature and produce a finished product approaching, as nearly as possible, a pure white. While the manufacturer endeavors to produce as pure a white as possible, he is to some extent limited in

HOW MUCH IS A SHOVELFUL?

When you tell a beaterman to throw in so many shovelsful of alum, are you sure he never makes a mistake?

Too much alum and the paper is brittle, the excess alum corrodes the wires and harms the felt. Too little alum results in poor sizing and weak paper.

With the Duriron Dissolved Alum System, the superintendent has exact control of the strength and amount of alum used. Space is reduced, size precipitation is better, specks and spots are eliminated, less alum is used . . . sizeable savings in dollars and cents.

All parts of the system are free from any corrosion by alum. Write for detailed information that we can't include here.

The DURIRON COMPANY, Inc.
General Offices and Plant: DAYTON, OHIO

WATERBURY FELTS

Are Made By

H. WATERBURY & SONS CO.

ORISKANY, NEW YORK

P. A. PAULSON, Consulting Engineer

Sulphite Mills a Specialty

Acid Absorption Apparatus . . . Simplified Cooking Method . . . Tubular Barking Drum . . . Thawing Conveyor . . . Bark Pressing Machine . . . Method for Saving B.T.U.

APPLETON, WISCONSIN

SWENSON

EVAPORATORS & FILTERS for Pulp Mills
SWENSON EVAPORATOR COMPANY
15653 Lathrop Avenue
Harvey (Chicago Suburb), Ill.

SINGLE! DOUBLE! TRIPLE!

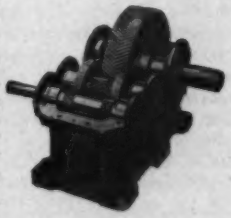
—every type of Herringbone Speed Reducer that you might need

JONES Herringbone Gear Speed Reducers are built in a wide range of ratios and ratings to cover every requirement. Single (Type SH) reducers in standard ratios range from 1.25 to 1 up to 11 to 1 in ratings from 1.3 to 440 H.P. Double (Type DH) reducers are built in standard ratios from 10.9 to 1 up to 72 to 1 in ratings from 0.5 to 275 H.P. The triple reduction reducers (Type TH) cover a range of ratios from 86.9 to 1 up to 355.8 to 1 in ratings from 0.3 to 78 H.P.

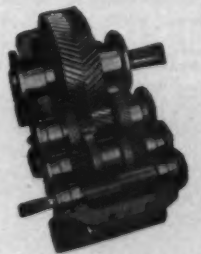
All these reducers have heat treated gears, ground shafts and are mounted with anti-friction bearings throughout. Cast iron bases are available for all variations of motor assembly. Liberal stocks are carried to facilitate shipments.

W. A. JONES FOUNDRY & MACHINE CO.
4439 Roosevelt Rd., Chicago, Ill.

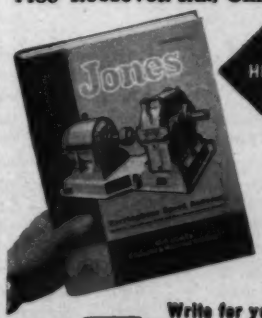
Single Reduction Type SH



Double Reduction Type DH



Triple Reduction Type TH



HERE'S THE LATEST INFORMATION

about the application of Herringbone Reducers

This new 128-page catalog of Jones Herringbone Reducers presents a vast amount of data relating to Herringbone Reduction Units. Illustrations show a broad range of herringbone reducer applications and the technical information shows how to select reducers for all conditions of service in accordance with the A.G.M.A. recommended practice.

Write for your free copy of this valuable treatise

Since 1890

Jones

HERRINGBONE — WORM — SPUR — GEAR SPEED REDUCERS
CUT AND MOLDED TOOTH GEARS — V-BELT SHEAVES
ANTI-FRICTION PILLOW BLOCKS — PULLEYS
FRICTION CLUTCHES AND TRANSMISSION APPLIANCES

BETTER

THE exclusive features of Johnson Rotary Pressure Joints bring savings in steam-fit maintenance and fewer shutdowns which will quickly pay the moderate cost of changeover. They are self-lubricating, packless, self-adjusting and, above all, self aligning.

If you're now using the old-fashioned packed steam fit, switch to the Johnson Joints that are saving time, steam and power in scores of mills. They always pay their way in dollars saved.

There's a Johnson Joint for every make of paper machine with any type of drainage.

WRITE FOR LATEST BULLETINS.

THE JOHNSON CORPORATION, 845 Wood St., Three Rivers, Mich.

his bleaching process to a treatment which will not be so severe as materially to lower the physical and chemical properties of the finished product. The result is that the bleaching operation is more or less a compromise in which some sacrifices must be made to color on the one hand and to physical properties on the other hand. In the measurement of color of bleached pulps dirt, of course, plays as important a role as in unbleached pulp. Systems have been well developed for measuring the amount of dirt in a sample of bleached pulp, but the measuring of color, we should consider the color value of the mass of fibers alone and leave out of consideration any foreign matter which may be present.

At the present time, automatic recording spectrophotometers are very expensive instruments. They may be easily damaged by unskilled operators and the interpretation of the results must be left to those who have sufficient training to evaluate them correctly. On the other hand, brightness meters are comparatively inexpensive and if periodically standardized against a recording spectrophotometer, they serve very well indeed as a control instrument. They are relatively simple to operate and are sufficiently rugged for genreal use.

When dealing with pulps which have been highly bleached, it is obvious that we should handle the sample as little as possible if we wish to obtain a true reading of the color value. This fact should be given due consideration by the manufacturers of brightness meters and they should be so constructed that samples of sheeted bleached pulp will show the same reflection factor reading regardless of the way the sample is placed on the viewing aperture. This is not true at the present time. It could be remedied by incorporating an integrating sphere or by using a system of diffuse illumination of the sample with vertical scanning by the photocell.

It is hoped that as time goes on, sufficient demand for automatic recording spectrophotometers will arise to stimulate the manufacturers to lower the cost and still further improve the construction of these instruments so that they will come into more universal use and that the public in general will come to recognize in a spectrophotometric curve the precise measurement of color.

Methocel—Properties and Suggested Uses In the Paper Industry

R. M. UPRIGHT[1] and F. C. PETERSON[1]

Methocel is being manufactured at present only as a water soluble type which represents approximately the dimethyl ether of cellulose. This derivative, a white fibrous solid, dissolves in cold water yielding neutral solutions which are odorless, colorless and nontoxic. It is insoluble in hot water and the common organic solvents and is unaffected by oily or greasy materials if animal, vegetable or mineral origin. Methocel is resistant to the action of alkalies and dilute acids.

Methocel dissolves readily in water to give clear, colorless haze free solutions. This may be accomplished with little difficulty by first thoroughly wetting the material with hot water (80-100 deg. C.). The mixture is then cooled to room temperature or below, preferably 5-10 deg. C., and is stirred until a smooth solution results. Since Methocel may be suspended in hot water for prolonged periods of time without harmful effect, this latter operation need not be hastened. Gradual cooling, overnight, may be preferred for convenience.

The initial use of hot water is to be emphasized in order to hasten solution. Such pretreatment promotes uniform penetration and wetting of the entire mass.

When correctly prepared, Methocel solutions are stable on long standing and ordinarily do not require a preservative.

Aqueous Methocel solutions are not affected by changes in acidity or alkalinity over a pH range of 2 to 12. They are, however, coagulated by the addition of solutions of certain soluble salts, such as the sulphates, chlorides and nitrates. Several others, including the soluble iodides and thiocyanates act to retard gelation of Methocel when heat is applied to aqueous solutions containing them.

Methocel is available in six viscosity types. These six types make possible a wide range of solution viscosities for a given content of Methocel. The low and the medium types are recommended where high solids content and low solution viscosity are desired. The high and extra high types are most suitable in applications where viscous solutions are desired with a minimum solids content. Final choice of the correct viscosity type for a specific application is best determined by experiment.

When a cold solution of Methocel is heated, its viscosity decreases rapidly at first. A point is eventually reached at which small increases in temperature produce a rapid increase in viscosity. With a range of very few degrees, the solution is transformed to a firm gel. The temperature at which this occurs is referred to as the gelation temperature or gel point. In general, the greater the concentration of Methocel, or the higher the viscosity type, the lower will be the temperature at which gelation occurs. In other words, thin solutions gel at higher temperatures than do heavy ones.

Aqueous solutions of Methocel can be blended with aqueous dispersions of starch, glue, casein, rubber latex, dextrin and water-dispersible natural gums. It is advisable, when making such mixtures, to prepare solutions of the individual constituents separately. This is particularly recommended when working with materials which are normally brought into solution by the aid of heat, such as starch and glue. Final blending should take place only after both the Methocel and the solution of the other material have been brought to room temperature. For this reason, the concentration of the material selected to combine with the Methocel must be limited to that which will remain fluid at room temperature.

The incorporation of a plasticizer into the mixture may be desirable for certain use requirements. When this is necessary, it should be added to the Methocel solution before blending. Large proportions of the more common water soluble plasticizers such as glycol, diethylene glycol, glycerin, invert sugar, sorbitol and mannitol may be added in this manner.

The addition of small proportions of ethyl alcohol to Methocel solutions increases their apparent viscosity and raises their gel point. The extent to which these properties vary will be determined by the viscosity type employed and the concentration of the solution.

Aqueous solutions of Methocel deposit hard, tough and highly flexible films on drying. These properties make it particularly adaptable as a coating for paper either alone or in combination with those mate-

(1) Cellulose Products Division, The Dow Chemical Company, Midland, Michigan.

Send For YOUR Copy of WARREN'S "P.A. DATA SHEET"

IF you want to reduce pump maintenance and power consumption in your mill, you need facts—facts that Warren's Pump Audit will help you get promptly and thoroughly.

A new service to pump users offered exclusively by Warren, the Pump Audit is a simple, practical method designed to (1) put your pump performance on record (2) enable you to compare it with performance of modern, efficient equipment (3) provide a sound basis for a replacement program that will pay its way.

First step toward saving with the Pump Audit is the "P. A. Data Sheet". Send for your copy today. And if you want the Pump Audit made in your mill without charge or obligation, check your Warren representative or write.

WARREN PUMPS

Warren Steam Pump Company, Inc. Warren, Mass.

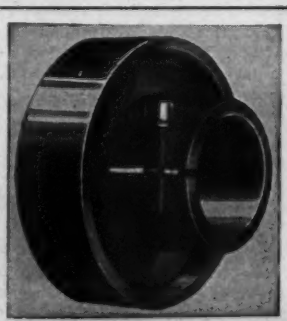
See the Warren exhibit, Booth 31, at the Superintendents Convention, Cincinnati, June 18, 19 and 20.

SIMPLICITY

WOOD CHIP SCREENS

Are screening chips and sawdust in many key plants in the United States and Canada. Every operator is a Booster, because capacity and low cost operation is assured by a Guaranteed Simplicity Installation.

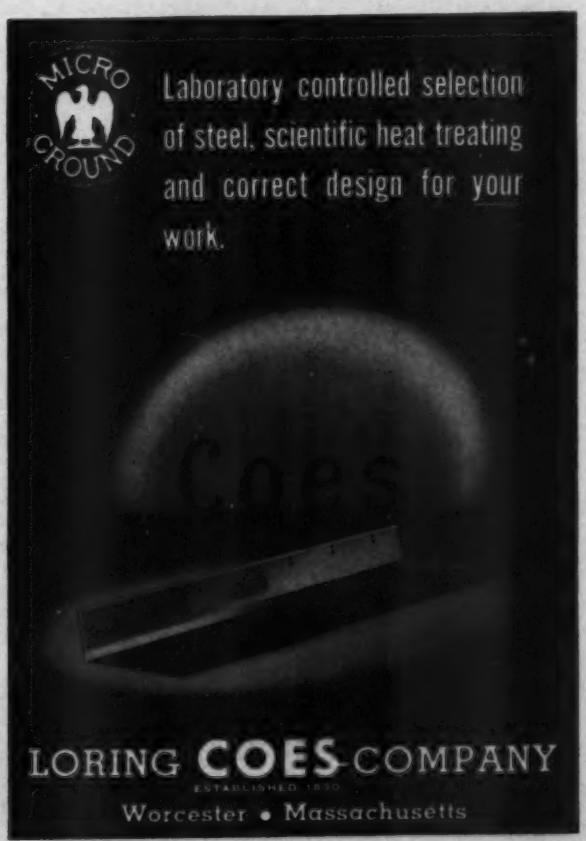
SIMPLICITY ENGINEERING CO.
Durand, Michigan



SPECIAL CLAMP LOWER SLITTER

Single or Double Cutting Edge

CHARLES KOEGEL'S SONS, INC.
Holyoke, Massachusetts, U.S.A.



ENGLISH ECCO CLAYS TRADE MARK CLAYS

UNIFORM • SUPERIOR • DEPENDABLE

English China Clays Sales Corporation
551 Fifth Avenue, New York City

rials now in use. Methocel coatings are colorless, tasteless, transparent and stable to heat and light. They will not decompose or deteriorate with age. One pound of Methocel applied as a coating 0.001 in. thick will cover 24,600 square inches of area.

Paper or paper board when coated with a continuous Methocel film is converted to an oil and grease resistant material. Paper so coated will permanently resist the penetration of vegetable and mineral oils even at elevated temperatures.

Greaseproofness of a Methocel coating appears to be directly related to the viscosity of the coating solution rather than to the viscosity type of Methocel, provided equal weights are applied. Direct advantages are thus to be obtained from the use of higher concentrations of the low or extra low viscosity grades, since a smaller quantity of solution containing a higher solids content may be satisfactorily applied.

The amount of coating required will depend primarily on the degree of greaseproofness desired and upon the paper being treated. A slack-sized paper will require more than one which is hard sized since the latter aids in preventing penetration of the coating solution. The presence of such fuzz will also demand an increased amount of coating in order to obtain coverage of protruding fibers and prevent wicking of the oil or grease through the coating. In general, the amount of Methocel required will range from 1 to 2 pounds per thousand square feet of paper or board.

The use of small quantities of Methocel applied as a base coat on waxing boards results in a decrease in the amount of paraffin required for satisfactory coverage by preventing penetration into the stock. Outstanding, however, is the noticeable retention of opacity and whiteness after such treatment.

The inert and colorless nature of Methocel coatings permits the use of inks of any color without fear of change in shade during printing.

Quantities as little as 0.1-0.2 lb. per thousand square feet of surface produce a marked improvement in the final gloss of the ink used for overprinting. The use of a 3-5 per cent solution of Methocel in the low or extra low viscosity types when applied on the calenders is preferred for ink or varnish applications.

Since the amount of Methocel required for coatings of this nature is relatively small, it may be successfully applied at the calender stacks even though weights are used. If two stacks are employed it is preferable to apply the solution from the second one.

An Evaluation of Calcium Carbonate Coating Colors Formulated With Various Adhesives

H. F. RODERICK and A. E. HUGHES
Michigan Alkali Company

Recent developments have shown that a number of substances are suitable for incorporating in the coating color as the adhesive.

Casein, soya bean protein and the starches are the most commonly known adhesives. Therefore, the findings reported herein relate to these substances.

The casein used was a granular material and it is representative of the average grades employed by most coating mills. It is readily dissolved by heating to 130 deg Fahr. in the ratio of 100 parts of casein to 600 parts of water containing 16 parts of mixed alkali (2 parts of soda ash to 1 part of borax).

Three representative starches were selected for study and dispersed in water at 190 deg. Fahr. in a ratio of 1 part of starch to 5 parts of water. They are described as (1) a thin boiling, oxidized starch of rather high viscosity when cooled to 100 deg. Fahr. (2) an oxidized corn starch of medium viscosity (3) a modified corn starch of low viscosity.

The soya bean protein used was a granular material and it is representative of a grade employed by a number of paper mills for coating and other purposes. It is readily dispersed at 160 deg. Fahr. in a ratio of 100 parts protein to 600 parts of water containing 10 parts of soda ash.

The calcium carbonate employed is representative of a precipitated grade prepared specifically for coating paper and it is being successfully employed by a number of mills for this purpose.

The clay employed in the investigation is representative of a grade widely used in the coated paper industry. It is believed that the results obtained with these two pigments will not be far different from what one might expect to find in actual mill practice.

The raw stock paper employed is a grade suitable for coating and its evaluation is as follows:

Basis Weight (25x38—500)	41.5 lb.
Mullen Test	16.3
Tear (in grams):	
With	30.0
Across	35.4
Thickness	.004 in.
Size Test (dry indicator)	26.7 sec.
Porosity (Bekk)	27
Smoothness (Bekk)	25
Opacity	87
Brightness	81

The same raw stock was used throughout the investigation.

Pigments consisting of calcium carbonate and clay were weighed out dry and mixed with water so as to obtain slips containing 50 per cent solids and 50 per cent water. The required amount of prepared adhesive to give the desired degree of sizing was added to each of the slips. This mixture constitutes the coating color since no aids or preservatives were incorporated in the mix. The entire mixture was stirred by means of a laboratory stirrer for 45 minutes before screening through a 140-mesh screen.

The screened coating was then brushed onto the raw stock to a weight of 16 pounds per 500 sheets 25 by 38 inches. The brush-outs were made on a laboratory coating machine fitted with a doctor blade and micrometer gauge so that all coatings could be duplicated within ∓ one-half pound.

The coating colors prepared were:

- 100 per cent calcium carbonate with 5 to 41 parts casein
- 100 per cent calcium carbonate with 10 to 35 parts soya bean protein
- 100 per cent calcium carbonate with 10 to 45 parts thin boiling starch
- 100 per cent calcium carbonate with 15 to 45 parts oxidized corn starch
- 100 per cent calcium carbonate with 20 to 30 parts modified corn starch

and—

- Blends of 75 per cent calcium carbonate and 25 per cent clay
  - 50 per cent calcium carbonate and 50 per cent clay
  - 25 per cent calcium carbonate and 75 per cent clay with the required amount of each adhesive to impart to eacn of the coatings a bonding strength equivalent to a 4 to 5 Dennison wax.

. . . and that's the Oakite way

to clean save-alls

To clean save-alls THOROUGHLY, many mills use this fast, low-cost method.

A solution of the recommended Oakite material is applied by means of the inexpensive Oakite Solution-Lifting Steam Gun. That's all! Dirt, rosin, starch and other clogging deposits are THOROUGHLY removed. And what's more, you will be surprised at how much more quickly and easily the job is done this way. Yes . . . cost is unusually low, too! Write for FREE booklet describing steam gun and its many money-saving uses.

Manufactured only by

OAKITE PRODUCTS, INC., 16 Thames St., NEW YORK, N.Y.

Representatives in All Principal Cities of the U. S. and Canada

OAKITE *Certified* CLEANING

DIESEL ENGINE GENERATOR PLANT.

3-Duplicate 219 KVA G.E. Alternators 2400/480/240 v. 3 ph. 60 cy. 200 RPM each direct connected to 300 HP Buckeye Diesel Oil Engines complete. 10 years old. Perfect condition.

MOORHEAD-REITMEYER CO., INC.

30th & Brereton Sts. Pittsburgh, Pa.

MIDWEST-PULPERS

Write for Details

THE MIDWEST-FULTON MACHINE CO.

Dayton, Ohio

Pulp and Paper Mill Screens

of STAINLESS STEEL—COPPER—BRONZE—MONEL—CHEMICAL RESISTING ALLOYS

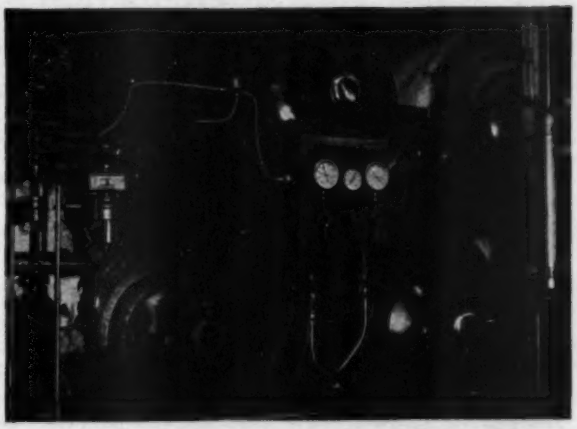
Perforations that are accurate in size and alignment

ANY METAL • • ANY PERFORATION

The Harrington & King PERFORATING Co.

5654 Fillmore St., Chicago, Ill., • 114 Liberty St., New York, N.Y.

Better Drying-Lower Cost of Operation with STICKLE SYSTEM



● Mills now operating paper and board machines equipped with Stickle Drainage and Controls report savings of 400 to 1200 pounds of steam per ton of paper dried. Within this range of steam savings doubtless lies the advantage modern Stickle Equipment will develop for you. 35 years of specialization on paper making problems relating to drainage, steam flow, steam pressure and heating efficiency has made possible this modern Stickle Equipment which supplies greatly increased drying efficiency, greatly improved products and greatly decreased production costs.

The new Stickle Automatic Tension and Thermal Control (illustrated above) stabilizes steam flow to paper machine, controls moisture within very close limits, eliminates cockle and drier snap-offs, reduces curling and shrinkage. Very little manual attention is necessary.

The Stickle Visible Micro Adjustable Orifice with Indicating Thermometer (shown at right) permits visible operation and accurate modulated temperature control on driers. It eliminates steam losses due to excessive "blowing through" into return line. It obviates guess work regarding operation and substitutes exact knowledge, obtained at a glance.

●

Ask for Bulletins Nos. 60 and 60C. Without obligation, let our engineers check with you on your drying problems.

STICKLE STEAM SPECIALTIES CO.

2225 Valley Avenue

INDIANAPOLIS, INDIANA

All of the coated papers were dried and conditioned for a period of 24 hours before calendering by a paper mill on a regular calendar stack. The calendered sheets were fully evaluated according to TAPPI standards, with the exception of the brightness, which was determined by means of a B. and L. opacimeter employing a magnesium carbonate standard white body.

Casein decidedly possesses the greatest bonding strength. Therefore, a smaller amount of casein is required for any fixed wax test than any of the other adhesives. Soya bean protein is next and the modified corn starch, oxidized corn starch and thin boiling starch follow in the order given.

The amount of adhesive required for a 5 wax would be as follows:

Adhesive	Pigment	Parts of Adhesive Per 100 Parts Pigment
Casein	$CaCO_3$	26
Soya bean protein	$CaCO_3$	29
Modified corn starch	$CaCO_3$	31
Oxidized corn starch	$CaCO_3$	34
Thin boiling starch	$CaCO_3$	40

Starches are probably the nearest approach to a desirable adhesive from the point of retaining high brightness and opacity values when relatively large amounts are included in the coating.

Casein and soya bean protein have a greater effect than do the starches on lowering the brightness. This property may be controlled to some extent by selecting the most desirable type of alkali and determining the required amount for a proper dispersion of these two adhesives. An excess of any alkali or prolonged heating will cause both casein and soya bean protein to become dark.

Increased amounts of any of the adhesives have a tendency to lower the opacity of the coated papers.

A decided decrease in ink receptivity is realized with increased amounts of any adhesive. As the adhesive is increased, the paper becomes more resistant to ink penetration.

The starches have the least effect on the decrease of this property, especially in the ranges of higher sizing. Calcium carbonate ranks high among the paper coating pigments in ink receptivity. Therefore, it is a suitable pigment to employ in coated papers where high wax tests are desired.

Higher smoothness values are realized by employing the starches; the modified corn starch gives the highest value. There is a tendency toward a maximum smoothness for the papers prepared with each adhesive—that is, as the ratio of adhesive to pigment is increased, the smoothness increases to a maximum. Beyond this point increased amounts of adhesive cause a lowering of the smoothness value.

There is a decided difference in the gloss obtained with the various adhesives. The highest gloss calcium carbonate is generally classed among the dull finishing pigments. However, by employing soya bean protein, thin boiling starch and smaller amounts of casein, desirable high gloss calcium carbonate coated papers may be obtained.

The relations pointed out in the above pertaining to the various adhesives with an individual pigment may serve as valuable information in predicting values and qualities of coated papers prepared from any individual pigment or a variety of blends of the various pigments. We have, however, prepared a series of blends of calcium carbonate and clay coated papers in which we have incorporated the required amounts of various adhesives to impart to the coating a bonding strength equivalent to a Dennison wax of 4 to 5.

The required amount of each adhesive for the blended pigments is in good agreement with the requirements shown for the individual calcium carbonate pigment.

Regardless of the adhesive used, the blends containing higher amounts of calcium carbonate produce papers which have a higher brightness.

There is a small drop in opacity as the clay ratio of the pigment blend is increased.

The gradual decrease in ink receptivity of the coatings containing higher amounts of clay is due to the clay in the blend and not to oversizing with either of the adhesives.

The smoothness values of the coated papers prepared from blends of calcium carbonate and clay are controlled more by the adhesive incorporated in the coating than by the ratio of either pigment to the other. The papers containing starches as the adhesive possess high calendered smoothness values and this is in agreement with the findings for calcium carbonate coated papers.

The gloss of coated papers prepared from blends of calcium carbonate and clay may be controlled by the adhesive employed as well as by varying the amount of clay or calcium carbonate composing the pigment. The starches do not produce coated papers with as high a gloss as those made with casein and soya bean protein. There is very little difference between the finish properties of coated papers prepared from blends of clay and calcium carbonate when either casein or soya bean protein is used.

Routine Determination of Bacterial Content of Paperboard

L. C. CARTWRIGHT[1] and S. S. EPSTEIN[1]

In the course of routine determinations of bacterial content of paperboard, we have developed a convenient technic of sampling which yields consistently representative samples without requiring the use of sterile containers or special asceptic technic at the point of sampling.

Each car of paperboard received by the converter plant is sampled. Five or more rolls of paperboard are taken at random from the car for sampling. A special knife, with an adjustable guard permitting it to cut to a predetermined depth, and a hand stapler are the only instruments required for sampling. The covering is removed from one side of a roll of paperboard and a sample approximately ten inches square is cut out to a depth of four or five layers. As each corner of the sample is cut free, the several layers are fastened together with staples. Sample identifications are marked on the outer layer. The samples are placed in a clean manila envelope and sent to the bacteriological laboratory.

In the laboratory, the outer sheets are discarded and the inner sheets are trimmed with sterile shears. Thus the portion of the sample actually used for bacteriological examination has been protected from any handling, dust or other source of contamination.

The pulping apparatus consists of a twin-propeller electric mixer with a special pulping churn. It is essentially as described by Sanborn [*American Journal of Public Health* 28, No. 5: 576-578 (May, 1938)], except that we use a welded stainless steel churn and stainless steel cover.

After asceptic trimming, the sample is cut into small pieces with sterile shears, and a 10 gram portion is weighed out in a sterile dish. The weighed sample is transferred to a sterile, cotton-plugged graduated Pyrex flask containing 1000 cc. of sterile water. The flask is placed in a refrigerator and the sample is allowed to soak for 2 to 6 hours at a temperature of 35 to 40 deg. Fahr. before pulping.

The churn, cover and propellers of the pulping apparatus are wrapped in paper and sterilized at 15 pounds steam pressure for 30 minutes. The bushings on the motor which project through the cover of the pulping churn are wiped with 95 per cent alcohol and flamed.

The soaked sample and the water in which it was soaked are transferred to the churn and the pulping apparature is assembled, using sterile forceps or sterile cotton to hold the parts during assembly. As a further precaution, the hands of the operator are rinsed with 5 per cent alcoholic phenol solution and wiped with a clean towel just before assembling the pulping apparatus.

The pulping motor is operated at high speed for approximately 25 to 30 minutes, or long enough to disintegrate the sample thoroughly. The progress of pulping may be observed at any stage by drawing part of the sample up into a sterile pipette inserted in the sampling hole in the cover.

When several samples, all of relatively low bacterial content, i. e., not more than a few hundred organisms per gram, are to be examined in succession, steam sterilization of the pulping apparatus between samples is not necessary. The apparatus is quickly disassembled and the contents of the churn are emptied. The churn is rinsed several times with sterile water, using a total of 2 to 3 liters for rinsing. The propellers and cover are dipped in 95 per cent alcohol and flamed. The next sample is then transferred to the churn and the procedure described for the first sample is followed. This technic results in negligible transfers of bacterial contamination from one sample to the next, as we have found by platings of the final rinse water from the churn.

The pipettes used for withdrawing aliquots for plating are ordinary 10 cc. Mohr pipettes, graduated between marks, with the tips cut and ground to an internal diameter of approximately 4 mm. These pipettes, with cotton plugs in their stems are sterilized by dry heat in the usual manner.

In the course of routine determinations, we have used three methods of plating the same samples in order to evaluate the methods. In Method I ten 5 cc. aliquots were plated in each of ten regular 100 mm. Petri dishes with 5.5 to 6.5 cc. of double

(1) Foster D. Snell, Inc., Brooklyn, New York.

. . . of ordering alkalies have gone out of date! Use Solvay Alkalies in the manufacture of your paper. *They are always as specified.* Write for a copy of the *Solvay Products Book.*

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 RECTOR STREET NEW YORK, N. Y.

BRANCH SALES OFFICES:

Boston Charlotte Chicago Cincinnati Cleveland Detroit New Orleans New York Philadelphia Pittsburgh St. Louis Syracuse

SOLVAY ALKALIES

FOR LOWER COSTS AND HIGHER PRICES

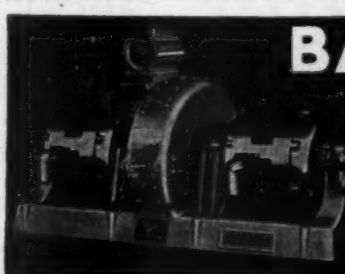
without risk, write:

ARTHUR B. GREEN, Engineer in Paper Making
284 Harris Avenue, Needham, Massachusetts

TRIMBEY MACHINE WORKS

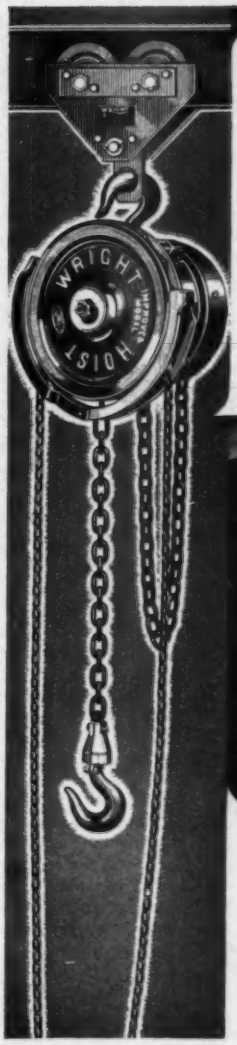
GLENS FALLS, N. Y.

Knotters — Pulp Screens — Float Valves — Consistency Regulators —Weight Regulators—Color and Alum Meters—Metering Systems



BAUER PULPERS AND REFINERS

Double-Disc and Single-Disc Machines for stock preparation, semi-chemical, semi-sulphite and all reject refining. Write THE BAUER BROTHERS COMPANY, Springfield, Ohio.



You Know You're Right

with

WRIGHT

Improved High-Speed

HOISTS

● Soon after you install a Wright Improved High Speed Hoist you know you have the right hoist. It always handles your jobs with speed, ease, safety and economy.

Every Wright Improved High Speed Hoist has 21 definite points of superiority. For example, there are precision load wheel bearings that assure fast, smooth, positive action. There is zinc coating that resists corrosion. There is a Wright load chain safety guard that makes it impossible for the load chain, regardless of position, to ride out of the pocket. The other 18 points are equally important.

Wright Trolleys are built to the same high standards as Wright Hoists.

Write for your copy of the Wright Catalog. It contains valuable information on hoists, cranes and trolleys in capacities from ¼ to 50 tons.

Order from your Distributor

BUY ACCO QUALITY *in Wright Hoists, Cranes and Trolleys; Lay-Set Preformed Wire Rope; Reading Pratt & Cady Valves; Campbell Abrasive Cutting Machines; American Chains; Page Welding Electrodes and Page Wire Fence.*

WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

strength standard nutrient agar.[2] In Method II a 10 cc. aliquot was plated in a 150 mm. Petri dish with 27 to 29 cc. of standard nutrient agar.[2] In Method III a 10 cc. aliquot was plated in a 150 mm. Petri dish with 27 to 28 cc. of standard nutrient agar[2] containing 2 per cent agar-agar.

In each method the aliquots were withdrawn from the churn during agitation of tne pulped sample and placed in sterile Petri dishes. The nutrient agar was then added to the dish and uniformly mixed with the aliquot of pulp by careful shaking of the dish. In order to minimize adventitious contamination, the nutrient agar for each Petri dish was put up and sterilized in an individual culture tube. Incubation of all plates was at 37 deg. C. for 48 hours.

Only 2.1 per cent of all the Method I plates developed spreader colonies, while 5.4 per cent of the Method III plates and 55 per cent of the Method II plates developed spreader colonies. Since the medium used in Method I contained 3 per cent agar-agar, in Method III 2 per cent agar-agar, and in Method II only 1.5 per cent agar-agar, the conclusion is obvious that increased concentration of agar-agar above that in standard nutrient agar is quite effective in inhibiting spreader colony growth in the examination of pulped paper as discussed. Our results also indicate that the higher agar-agar concentration yields higher and, therefore, more reliable bacterial counts.

(2) Standard nutrient agar: 0.5 per cent Bacto-peptone, 0.3 per cent Bacto-beef extract and 1.5 per cent Bact. agar-agar.

Dowtherm Indirect Heating Systems

PELL W. FOSTER, Jr.
Foster Wheeler Corporation

Dowtherm is a eutetic mixture of the organic compounds diphenyl and diphenyl-oxide. Dowtherm "A" which is the mixture that has been used particularly for high temperature processes, is made up of 26.5 per cent diphenyl and 73.5 per cent diphenyloxide. The characteristic which fits it particularly for use in high temperature heating problems is its high boiling point, as shown by the fact that under atmospheric pressure it has a boiling point of 500 deg. Fahr. and boils at 700 deg. Fahr. at 88 lb. gage.

Although an inflammable material, Dowtherm "A" cannot be considered particularly hazardous, as the possibility of explosion of either the liquid or the vapor is negligible. The liquid has a flash point of about 215 deg. Fahr. but cannot support its own combustion at this temperature. In general, it can be said that up to 700 deg. Fahr. the decomposition of Dowtherm "A" is practically negligible. From 700 deg. Fahr. to 750 deg. Fahr. measurable decomposition does occur and constant operation at these temperatures would require periodic repurification of the used material and the addition of a small percentage of new fluid.

The Dowtherm boiler, or vaporizer, must be built for the specific service involved and to meet the requirements of a fluid differing so widely from water.

Since Dowtherm "A" is an organic product, it is essential that vapor generators should be designed to provide positive and rapid circulation in order to avoid tube wall temperatures greatly in excess of the temperature of the vapor generated. It is also imperative that the boiler shall contain sufficient storage capacity for liquid Dowtherm to maintain proper height of liquid when the dense Dowtherm vapors have filled the entire process system. This supply of Dowtherm liquid should be out of contact with the heating surfaces but should always be available for circulation within the tubes.

The simplest form of Dowtherm indirect system is where the heat user is located at sufficient elevation above the Dowtherm boiler so that the condensed Dowtherm will return from the user to the boiler by gravity.

Where it is not possible to put the user sufficiently above the Dowtherm boiler to return condensate to the boiler by gravity, a Dowtherm return pump must be used.

Paper mill engineers have considered the use of Dowtherm as the heating medium in the rolls of dryers. Here the use of Dowtherm gives high temperature without requiring high pressure construction in the rolls.

Other uses for Dowtherm in paper mills will develop after the engineers of the industry have become more familiar with the peculiar advantages of this chemical for the purposes of both high temperature heating, and cooling.

Promoting Satisfactory Bacteriological Conditions in the Paper Mill

ROBERT F. HUNTLEY[1] and
R. HAMILTON TORREY[2]

The purpose of this paper is simply to set up an outline of methods and controls which have been found by certain mills to enable them to produce a paper with a low bacterial count which is satisfactory to the public health authorities for use in milk containers.

In the establishing of new production practices, it is first necessary to have some means of recognizing present weaknesses and measuring accomplishments. Most bacteriological laboratory procedures are of long standing. Others have recently been developed for the study of paper and paper products. Testing methods are rapidly being evolved which may some day be standard in our industry.

The chloramine process has been found very effective in reducing the bacterial count of the water. The laboratory test for bacteria count is the proper means of controlling the application of chloramine. If the counts are kept low, the chlorination is effective. If counts go up, chlorination is not effective regardless of chlorine residuals.

Due to the process it is assumed that chemical slush pulp coming out of the digester is practically sterile, and therefore it becomes necessary to see that the pulp does not become contaminated. Hence, wash water, pipe lines, and chests should be kept in condition that will not allow the pulp to become contaminated or inoculated with bacteria.

Due to the high temperature developed at the wood stone interface, groundwood pulp at this point approaches sterility. Pipe lines, screens, chests, vats, etc., should be kept clean. This cleaning procedure cannot be overemphasized. The system should be gone over at least once a day.

In making a low bacterial count paper, the wrappers on the lap pulp should not be used, as they have had every opportunity to become contaminated in shipping and handling.

Starch is a material which some mills have found to vary greatly in bacterial count. Starch should be used quickly and made up frequently as the temperature of the cooling starch is such that thermophilic organisms thrive and multiply very rapidly.

(1) Technical director, Sealright Company, Inc. (2) Sales division, Riegel Paper Corporation.

Alum and size offer practically no bacteriological problems, although size emulsions may contribute high counts unless care is taken to keep the emulsion storage tanks clean. Some of the prepared foam killers may offer bacteriological problems and should be studied.

Before starting up on a run of paper which must have a very low bacterial count, some mills have found it advisable and very effective to run a 1½ per cent hot solution of caustic soda through the lines and chests. Another method of sterilizing the system is to pump water having a residual of, say 1,000 parts of chlorine per million through the system. This may be allowed to stand in the beaters, chests, and pipe lines for several hours if it is done over the week end.

White water can cause a great many bacteriological troubles and problems, which can be greatly simplified if it is so treated that the white water system carries a small residual of chlorine—as low as .05 parts per million.

The bacterial count can be kept lower in a system of which the stock has a pH value of 5.0 or less, than one in which the pH is up around 7.0.

The drying operation is one of the most effective sterilizers that could possibly be devised, as due to the temperature at which the dryers operate, most of the bacteria will be killed in this operation.

In the production of low bacteria count paper, good housekeeping is a very important consideration not only from the actual contribution of contamination, but from the psychological effect on employees.

Periodic surveys should be made to determine the bacteriological status of the mill system as a whole, and also the individual components of the system.

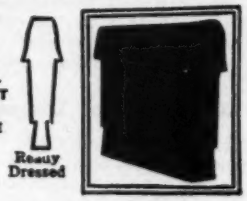
For a complete survey of a mill, we would suggest the following which any mill could modify to suit the particular conditions: (1) raw water, (2) coagulated water, (3) water after chlorination and filtering, which is the process water used in the mill, (4) pulp, (5) beater, (6) stock and broke beater, (7) pulp in the chests, (8) broke in the chests, (9) stock from headboxes, (10) in case of cylinder machines, stock from vats, (11) white water, (12) wet trim, (13) water in calender waterbox, (14) finished paper.

Samples taken from the above points should give a clear picture as to how the stock was progressing through the system, and if any bacteriological buildup is occurring, this data should show very clearly in what specific areas it is occurring.

"READY DRESSED" MILL COGS

LABOR SAVING—TIME SAVING

THE MOST ECONOMICAL FILLING THAT CAN BE PUT IN A MORTISE WHEEL



WE MAKE ANY STYLE OR SIZE WANTED

WRITE FOR INSTRUCTION SHEET "O" WHICH IS FREE

QUICK SERVICE ON ALL SIZES

THE N. P. BOWSHER CO., South Bend, Ind.

COLORS . . .

for Board and Paper

Green Chromium Oxides
Black, Brown, Red, Yellow Iron Oxides
Lamp Black—Umbers—Venetian Reds—Yellow Ochres

C. K. WILLIAMS & CO.
Easton, Pennsylvania

TAKE A

LOOK

6 PUBLICATIONS FOR PAPERMAKERS

Pulp Bleaching	$0.50
Technology of Papermaking Fibers	.50
Spots and Specks in Paper Murray M. Rubin and Milton L. Rubin	.50
Lessons in Paper Making—Part 1 Harry Williamson	.50
Lessons in Paper Making—Part 2 Harry Williamson	.50
Drying of Paper on the Machine B. M. Baxter	1.00

Now available postpaid from

FRITZ PUBLICATIONS, INC. 59 E. Van Buren St. CHICAGO, ILL.

Orr Felt invites you to visit the world's largest felt mill. When you attend the Superintendents' Convention at Cincinnati, Ohio, June 18, 19, and 20, take a half day and come to Piqua for a tour of our modern, completely equipped plant. Glad to see you—glad to show you through.

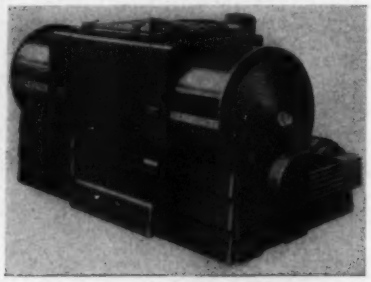
THE ORR FELT AND BLANKET CO.

PIQUA OHIO

NEW EQUIPMENT AND SUPPLIES

Mixing and Kneading Machine

The Patterson Foundry & Machine Company, East Liverpool, Ohio, has announced the development of a new line of mixing, kneading and processing machines. The line, designated as *Kneadermaster,* includes units in almost any capacity from 1/3 gal-



lon to 1500 gallons. The manufacturer states that the line represents entirely new design principles throughout; that the units have no mechanical resemblance to any former or competitive construction; and suggests that these machines are used effectively for size and clay suspension preparation, and for mixing and processing fibrous materials in fluid or other media.

Log Barker

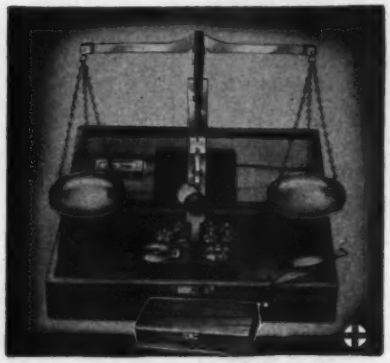
Fibre Making Processes, Inc., Tribune Tower, Chicago, Ill. has announced that it has acquired exclusive manufacturing and sales rights for the United States and Canada for the Ormmell log barker. This barker, said to be used extensively in both Sweden and Finland, is designed for the handling of full length logs. It consists of a series of specially built chains positioned in parallel in the form of a cradle in and above a water-filled vat, and with the headshaft end of the chain arrangement at an elevation somewhat above the vat and tailshaft.

Logs are dropped into the vat by a log haul and there they are agitated by the chains, the rubbing action of this agitation removing the bark from them, and finally they are removed from the vat by attachments fastened to the chains. Kickers, operated hydraulically by pushbuttons and located near the upper limit of chain travel and between the chains, return unbarked logs to the vat for further agitation and allow the clean logs to be discharged from the barker to a transfer conveyor. The bark, removed from the vat with the logs, falls through openings between the chains into a sluice or bark conveyor.

Among the claims for this barker are: large capacity, comparatively low power requirements, and cleaner and more uniform chips—resulting from the elimination of broomed ends and the chipping of full length logs.

Compact Balance

A compact balance that can be dismounted and stored in a laboratory drawer has been announced by the Clay-Adams Company, 44 East 23d Street, New York, New York. This balance, supplied with brass weights, has a capacity of 100 grams and a sensitivity of 5 milligrams. The beam is 7¼ in. long and carries a steel knife edge



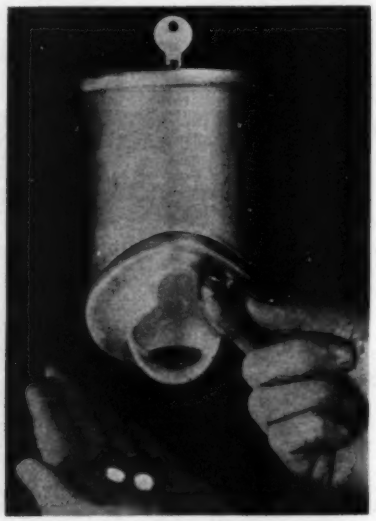
which engages an agate bearing on the beam support. Pans are 3¼ in. in diameter, and are notched to support test tubes. Metal parts are of brass and are chromium plated. A gumwood box, 10 in. x 4¼ in. x 2 in., houses both the balance and weights.

Wick Feed Oiler

Trico Fuse Mfg. Co., 2948 North 5th Street, Milwaukee, Wis., has announced a wick feed oiler in one, two, and four ounce capacities that is intended for use on machinery which operates intermittently. A lever at the top, when in vertical position, starts the feed; when flipped to the side, shuts off the feed. All metal parts of the oiler are cadmium plated. The bottle is said to be unbreakable.

Salt Tablet Dispenser

The Milburn Company, Detroit, Michigan, has announced a salt tablet dispenser which is made of an aluminum casting that

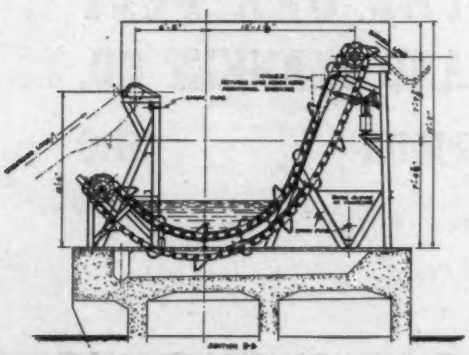


has been specially plated for corrosion resistance. This dispenser, which dispenses one tablet at a time, has a capacity of more than a thousand ten or fifteen grain tablets. A Yale lock safe-guards the contents as well as locks the dispenser to a wall bracket.

Gasoline-Powered Fork Trucks

Two gasoline-powered fork trucks, one known as Type KM (non-telescoping), the other as Type KMH (telescoping), and both available in capacities of 4,000 and 6,000 lb. have been announced by Baker-

Raulang Company, Cleveland, Ohio. With the standard overall height of 88 in., permitting entry into a box car, the non-telescoping truck has a fork lift of 70 in., the telescoping model up to 124 in. Under normal conditions, the trucks will operate in 6 ft. intersecting aisles. Travel speeds are governed normally to 7 m.p.h. in ac-



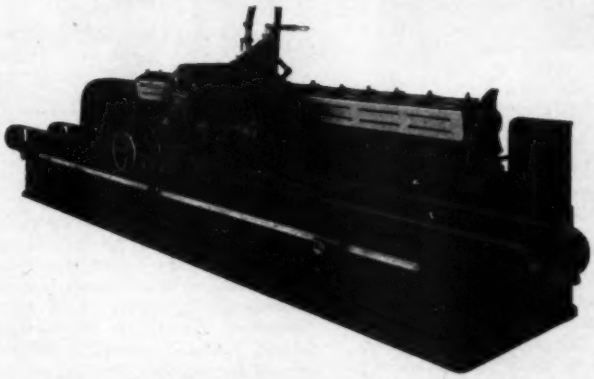
KNIFE GRINDING SERVICE

The Oldest · The Most Widely Employed · The Newest

The Covel-Hanchett slitter knife grinder, for universal and precision slitter grinding service, built for accurate finish and long time operation, now thoroughly proven and widely employed.

Timken Roller Bearing and Precision Ball Bearing construction helps identify it as Covel-Hanchett service.

For Slitter Knives

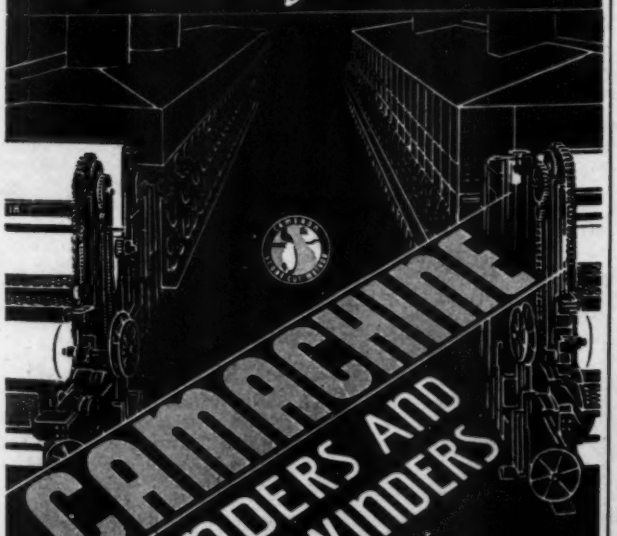


Covel-Hanchett Mammoth Traveling Wheel Grinder, for long knives, short knives in multiples, heavy knives, light knives, doctor blades; for real economy from the heaviest requirements in stock removal to the extreme in accuracy and light cuts, with preloaded precision bearings and automatic lubrication; has now established such wide recognition as to represent the standard in the industry—the highest standard ever reached in paper knife and doctor blade grinding service.

Our new catalogue covering *all* saw and knife fitting requirements should be always available for your reference. Sent free upon request.

COVEL-HANCHETT CO.—Big Rapids, Mich., U.S.A.

for Producing Bag Rolls, Shipping Rolls Counter Rolls, Board Rolls, etc.



CAMACHINE

WINDERS AND REWINDERS

CAMERON MACHINE COMPANY

61 POPLAR ST. - - - - BROOKLYN, N. Y.

SAVE POWER

with....

Roots

CONNERSVILLE

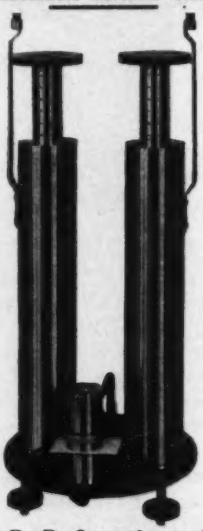
Vacuum Pumps

ROOTS-CONNERSVILLE BLOWER CORP.

406 Monroe Ave. Connersville, Ind.

GURLEY PAPER TESTING INSTRUMENTS

For Testing Porosity—Stiffness—Smoothness—Softness—Sizing



Gurley R. D. Smoothness Tester

Tests felt and wire sides of paper sample simultaneously. Low clamping pressure, does not compress sample. Simple sensitive and accurate.

Described in Bulletin No. 1490

W. & L. E. GURLEY

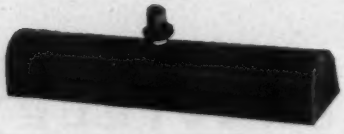
America's Oldest Instrument Makers

TROY, N. Y., U. S. A.

cordance with latest safety recommendations, but higher speeds are available, if desired. Lifting speeds are up to 30 f.p.m. and lowering speeds to 75 f.p.m. The engine of this new series is a 4-cylinder Hercules industrial engine. It is rubber mounted to reduce vibration. Hydraulic brakes are provided on the drive wheels and all controls are of the automotive type.

Fluorescent Lighting Developments

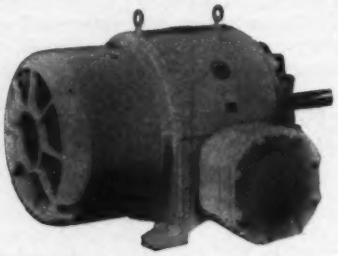
Van Dyke Industries, 2900 South Halsted Street, Chicago, has announced a new suspended type fluorescent lighting fixture and a new screw-in socket fluorescent. The lighting fixture is supplied in 18, 24, 36, and 48-inch lengths, is self-contained; and is recommended by the manufacturer for inspection work and for general illumina-



tion in a paper mill. The screw-in socket fluorescent, also self-contained, and can be screwed into a socket as easily as a light bulb. The manufacturer recommends it for locations where there are present drop cords and side fixtures. This lamp, supplied in two sizes to take either the 15 or 20-watt tube for a-c current only, is claimed to be particularly desirable for color discrimination and general inspection.

Explosion-Proof Motors

U. S. Electrical Motors, Inc., Los Angeles, California, has announced that the ratings of its Class I Group D explosion-proof motors have been increased from 25 to 75 hp. and that, likewise, the ratings of



its Class II Group G motors have been increased from 7½ to 75 hp. The larger motors are of the shell-type frame construction and have a specially designed fan, which, according to the manufacturer, is quiet even at high speeds.

Braided Packing

The Garlock Packing Co., Palmyra, N. Y., has announced the development of a braided packing which it has designated as the *Garlock Lattice-Braid*. In this packing, every braiding strand passes diagonally through the body of the packing at an angle of approximately 45 deg. Structurally, every braiding strand contributes to the strength of the entire mass.

Among the outstanding characteristics of this packing, cited by the manufacturer, are the following:

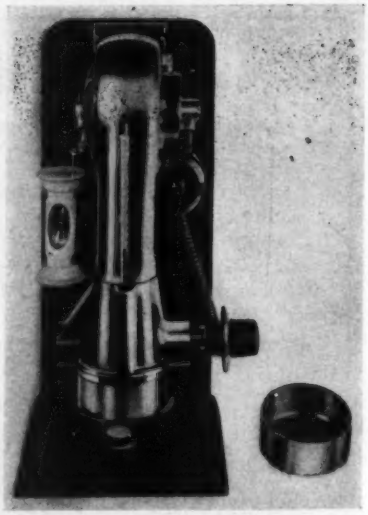
No matter how badly the packing becomes worn it will not disintegrate into a series of loose strands or separate parts.

The braided structure imparts a flexibility not obtainable in packings of standard braided construction.

Controlled porosity is built into the structure of the packing.

Moisture Tester

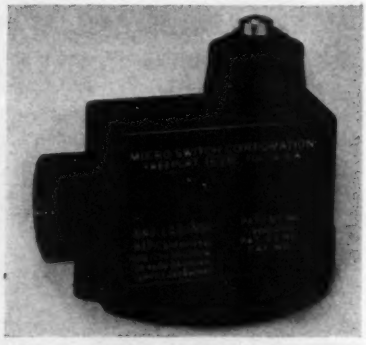
Harry W. Dietert Company, 9330 Roselawn Avenue, Detroit, Michigan, had added a new size moisture tester to its line of instruments which are designated as *Moisture Tellers*. This tester takes a sample pan 2¾ in. in diameter and 1¼ in. in depth. The bottom of the sample pan is made of 500 mesh Monel filter cloth. The sample pan, containing sample to be dried, is placed under the heated air outlet of the instrument. The air, being above the steaming point of water, flashes the moisture in the sample to steam and blows it through the bottom of the pan. The sample



of any one of many materials, according to the manufacturer, may be dried to constant weight in as short a time as one minute. Temperature of the drying air is controlled automatically by means of an adjustable thermostat. For accurate moisture determinations, a sensitive analytical balance may be used for weighing the pan and sample.

Water- Oil- and Dust-Tight Switch

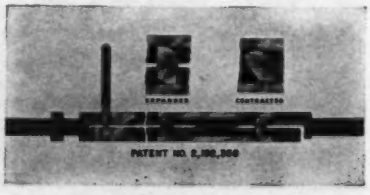
A water, oil and dust-tight switch for use with ½ in. conduit has been developed by the Micro Switch Corporation, Freeport, Illinois. The housing of this



switch is of die cast metal, the base plate of the housing being gasketed. A moulded Neoprene seal surrounds the plunger mechanism. No. 14 solid wire can be handled by the terminals.

Collapsible Winder Shaft

D. J. Murray Mfg. Co., Wausau, Wis., has announced a patented collapsible winder shaft which is milled from solid steel. The shaft expands automatically and is said to be easy to operate.



"NON-USERS ARE THE LOSERS"

TENAX FELTS

FINISH AND TRIM

"men and minds meet"

Many Superintendents will carry problems to the Convention for discussion with friends—one of which will be *operation of felts.*

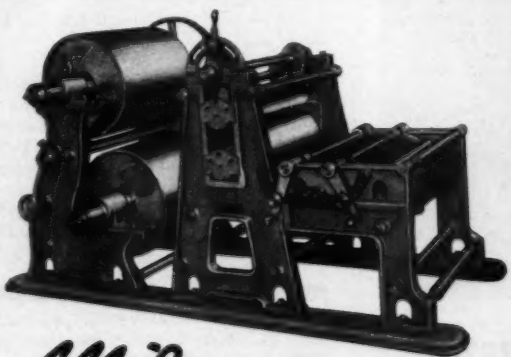
By specifying TENAX FELTS you have complete assurance of uniformity, constant helpfulness in producing perfect paper, ability to get rid of water at the presses, and long-lasting usefulness.

If not already using TENAX FELTS, a review of their favorable record will prove it advisable to start now, in this, THE FIFTIETH YEAR OF PROGRESS OF TENAX FELTS.

"Non-Users Are The Losers"

LOCKPORT FELT COMPANY

Newfane, N. Y.—U.S.A.



All Purpose

. . . WAXING UNIT

Used by many large producers of wraps and bags to enable a combination of printing and waxing; or printing, waxing and bag conversion; into a single operation.

Furnished complete with drives so that waxer may be set back of printing press or between printing press and bag machine.

Produces an excellent sheet, one or both sides waxed, with perfect control of wax percentages.

HUDSON-SHARP

MACHINE CO • GREEN BAY • WIS

NO MAINTENANCE IN A YEAR OR MORE OF OPERATION

That's why mills are now installing more Murray Flat Screens.

NO NOISE NO VIBRATION

This new Murray Flat Screen is one of a number in continuous operation for over a year in a leading paper mill without even a wrench being applied. Its capacity is greater, stock cleaner, power less than other types of equipment, aside from its minimum maintenance. This screen has a special drive developed to meet exacting and heavy-duty requirements at high speed—modern equipment for the mill that must improve quality and cut operation costs to meet competition. Repeat orders from users of the New Murray Flat Screens testify to satisfactory performance. The ideal screen for pulp, paper, roofing and board mills. Write for complete details.

D. J. Murray Mfg. Co.

WAUSAU ~ WISCONSIN.

TECHNICAL DEVELOPMENTS

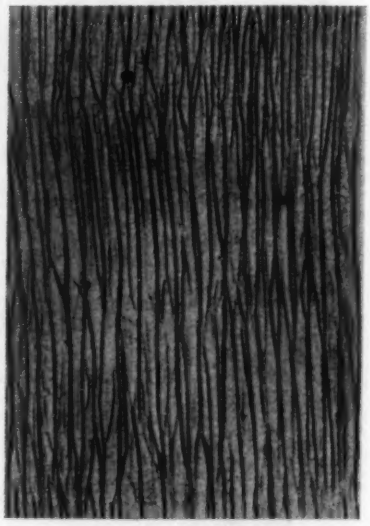
The following abstracts are of the latest developments found in the foreign press.

Stiffness Tester for Paper and Board

The sample to be tested is clamped between clips so that a semicircular arc, 10 cm. in diameter, is formed. The entire set-up including the sample is placed upon a balance-pan adjusted to the equilibrium position. In making a determination, the clamps are lowered 1 cm. so that the paper arc which touches a glass plate is deflected. The weights required to produce equilibrium in this new position furnish a measure of the resistance to bending. Comparatively little difference was noted with samples tested at 40 per cent and 65 per cent relative humidity. However at 90 per cent relative humidity, different furnishes were differently affected. There is also a difference in stiffness between the machine and the cross direction of the paper. In some but not all individual samples, there was a correlation between the ratio of stiffness in the machine and the cross directions and the ratio of tearing strengths in these directions. This does not hold for coated papers. The instrument herein described is a modification of one devised 5 years ago, the principle of which was described in Papier-Fabr. 33, 137-43 and 146-51 (1935); cf. The Paper Industry (July, 1935) for full description and illustrations. J. Bekk. Zellstoff u. Papier No. 1 6-8 (1940) through Bull. Inst. Paper Chem. 10,249 (1940).

Anatomical Evaluation of Pulp Woods

This is another contribution to the studies carried out in Germany on tropical woods. Sixty species of widely distributed woods from Cameroon were examined. The distribution of the trees, maximum and minimum fiber lengths, fiber quality, per cent fibers, bulk density, variation in cellular structure and in color were recorded in tabulated form. On the basis of such studies only fifteen woods emerged with pulp-making possibilities. Unfortunately some of the longest fibered woods, like Uapaca, Panda and Mitragyne were not available in sufficient quantity for making commercial cooks. However when such cooks were carried out on the following they all showed promise from the standpoint of yield, beating time, tear, stretch, pop-test, and folding endurance: *Symphonia gabonensis, Rhizophora mangle, Alstonia congensis, Pycnanthus kombo, Canarium Schweinfurthii,* and *Musanga Smithii.* The data are compared with



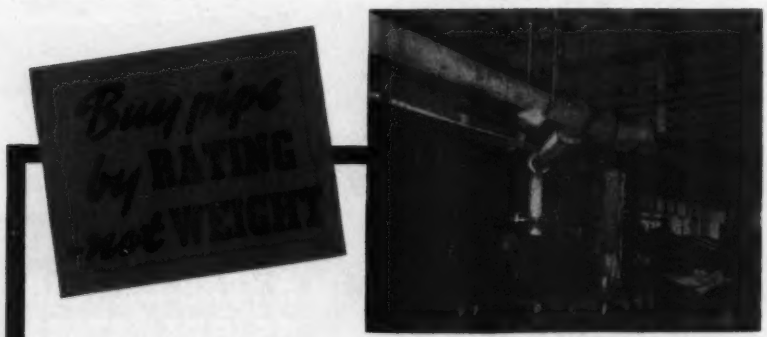
those obtained from the pulp of the excellent pulp wood *Araucaria angustifolia.* A photomicrograph of a longitudinal section of *Musanga Smithii* is shown in the accompanying illustration. Bruno Huber and Eberhard Schmidt. Wochbl. Papierfabr. 71, 125-30 (1940).

Lauan Wood Pulps

The sulphite digestion of red and white lauan woods at 8 atmospheres, 140 deg. (maximum temperature) and 8-9½ hour periods resulted in 44-47% unbleached pulps that contained 1.9-2.7% lignin and about 94% alpha-cellulose. The Roe number was about 3. As with all hardwoods, the maximum pressure reached during the cook had a very marked influence on the degree of pulping. Eisio Hu. Cellulose Ind. (Tokyo), 15, 52-3 (1939) through C. A. 34, 2591 (1940).

Manchurian Wood Pulps

Manchurian spruce (*Picea obovata,* Ledeb), fir (*Abies nepherolepsis*), and aspen (*Populus maximowiczii,* A. Henry) were all digested by the sulphite process. In each case the seven different samples were cooked with liquors containing 4.3-6.2% total sulphur dioxide, at a maximum temperature of 145-155 deg. and a maximum pressure of 4.5-6.5 kilos/ sq. cm. for 9-15 hours. The highest yields were obtained with spruce unbleached pulp (46.7-52.4%) but this pulp also contained the highest lignin content. Strangely aspen gave almost as high a yield, and showed the highest alpha-cellulose content of the three woods studied. On bleaching, this aspen pulp also loses the least, and again contains the highest amount of alpha-cellulose (85.2-89%) (See however the work of Miura referred to in THE PAPER INDUSTRY AND PAPER WORLD, April 1940, p. 89). Aspen pulp, as would be expected, has the highest pentosan content; fir the lowest. The digestion of all



—and your pipe costs will come down!

IT IS strange but true that in many mills heavy wrought pipe is being used for jobs that could be handled by Taylor Spiral at a remarkable saving.

Never forget that Spiral Pipe as made by Taylor Forge is about 50% lighter than wrought pipe of equal strength and more than 50% below it in *installed cost.*

Reinforced from end to end by the tough, stiff, spiral seam, Taylor Spiral Pipe is stronger in every way than even a seamless tube of equal gauge. It is the paper mill's own pipe—easiest to install—easiest to remodel. And remember that Taylor Light Weight Fittings and Special Fabricating Service are the answer to the most intricate pipe layout.

TAYLOR FORGE & PIPE WORKS

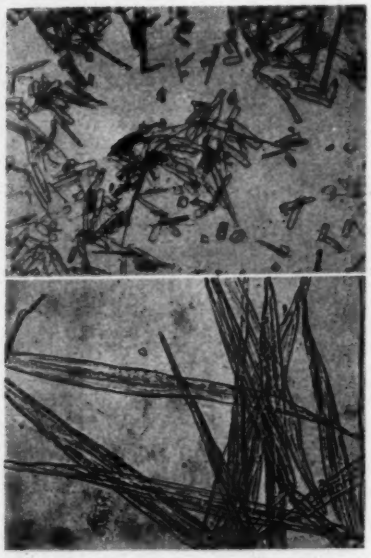
General Offices and Works: Chicago, P. O. Box 485 . . New York Office: 50 Church St

TAYLOR *Spiral* PIPE

these pulps was readily carried out. Nobuhiko Migita. Cellulose Ind. (Tokyo) 15, 54-8 (1939) through C. A. 34, 2591 (1940).

Cell Walls of Tropical Woods

This appears to be one of a series of studies on possible papermaking woods of the tropics—a series of studies now being carried out in Germany. The author indicates that the fractions of some of these tropical woods, which are entirely freed from fibers, and which comprise only parenchymatous elements may still yield pulp sheets with marked strength. For example, balsa wood treated in this way (Figure 1) yields a paper with a breaking length of 13,144 meters and 4740 double folds, de-



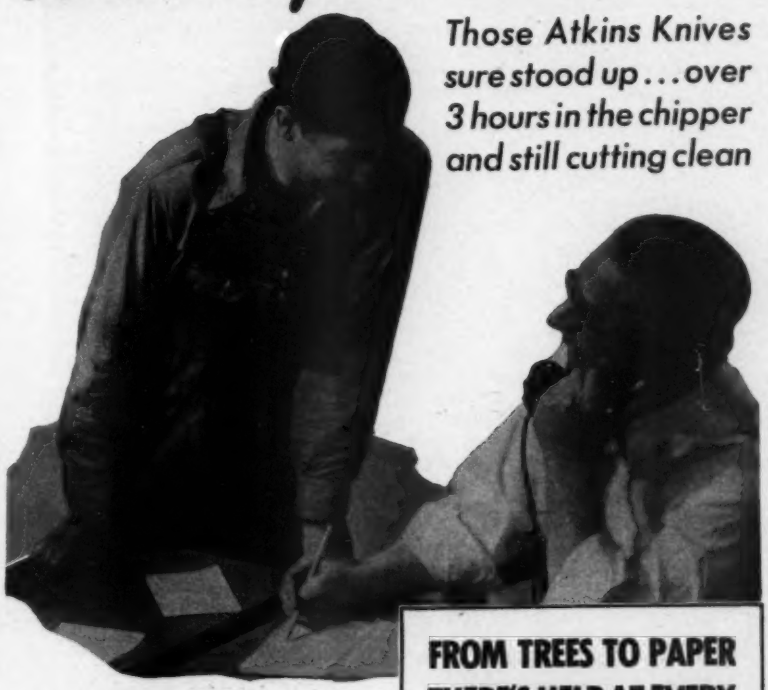
spite the fact that its resistance to tear is relatively low. This led to the study of a group of tropical woods which are rich in non-fibrous elements. These include such woods as the umbrella tree *(Musanga smithii)*, the mangrove *(Rhizophora mangle)* and others, which were delignified by the sulphate method. Data with regard to bleaching, beating time and degree, folding endurance, Elmendorf test, total (Pfretzschner) strength test, bursting strength, etc., are given together with many photomicrographs. For example, Figure 2 shows the pulp of Musanga smithii, × 85, prior to bleaching and beating. The author gives 30 references. R. Runkel. Wochenbl. Papierfabr. 71, No. 9 93-102 (1940).

Italian Cellulose Resources

The authors discuss the chemical and physical properties of three plants available for the Italian pulp industry as possible cellulosic raw materials. They are (1) *Ampedolesmos tenax* of Sicily and Calabria containing 47 per cent cellulose; (2) papyrus from Lake Tana and the Blue Nile, with 50 per cent cellulose, and (3) asphodel (silver rod or king's spear) growing very widely in Sardinia with 55 per cent cellulose. C. Levi and M. Marini. Atti X° congr. Intern Chim. 4, 157-68 (1939) through C. A. 34, 2170 (1940).

Your Hunch Was Right, Boss!

Those Atkins Knives sure stood up . . . over 3 hours in the chipper and still cutting clean



● Whether a change to Atkins Chipper Knives helps improve the uniform quality of your chips pulp . . . or decreases time lost for grinding and knife changes . . . the result is the same: Greater output, money saved and an extra profit earned on the chipping operation.

Actually, as proved by the records of large users, there's a better than even chance that Atkins Knives will do both.

Scientific Manufacture

In the world's largest exclusive knife factory Atkins Chipper Knives are made of special analysis steel, specially heat treated, tempered and ground. This quality steel combines with the right shape and bevel to provide tough, edge-holding chipper knives . . . Atkins by name. Try a set.

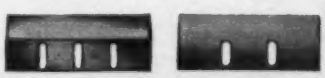
E. C. ATKINS AND COMPANY

453 So. Illinois St., Indianapolis, Ind.

FROM TREES TO PAPER THERE'S HELP AT EVERY STEP FROM ATKINS

Co-ordination all along the line

CIRCULAR AND CROSSCUT SAWS



CHIPPER KNIVES

PAPER SLITTERS, KNIVES AND SHEARS

PAPERMAKING PATENTS

IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington, D. C.

Paper Making Apparatus

Patent No. 2,162,403. Charles Willmott Howard, Franklin, Ohio, assignor to The Black-Clawson Company, Hamilton, Ohio, a corporation of Ohio. Application January 15, 1937, Serial No. 120,779. 4 Claims. (Cl. 15—93). Apparatus of the character described comprising a frame, a series of spaced edged blades carried by said frame and arranged in a series one above the other for engagement with one side of a web of material means for guiding the web of material past said series, a second series of blades adapted for engagement with the opposite side of the web, a common support for said second series, the edges of said blades pointing toward the oncoming web, and the blades of the second series being arranged opposite the spaces between the blades of the first series and normally providing a zig-zag path for the web, means on said frame for guiding said support for rectilinear movement in a direction transversely of the general line of travel of the web past the blades, a toggle arm pivoted on said frame and a toggle link pivotally interconnecting said toggle arm and said support and adapted to be moved into alignment with the toggle arm to locate the support in a predetermined operative position with the blades of said second series engaged with the web, and means for operating said toggle arm.

Process of Purifying Cellulose Materials

Patent No. 2,195,396. Nils W. Coster, Everett, Wash., assignor to Soundview Pulp Company, Everett, Wash., a corporation of Washington. Application October 22, 1937, Serial No. 170,447. 3 Claims. (Cl. 8—105). The process of purifying cellulose material which comprises preparing the material for a condition of suspension, circulation or agitation in a vat, adding thereto an amount of chlorine gas, and after absorption of the gas by the material, adding a hypochlorite solution at such rate as to be instantly converted into hypochlorous acid, which, in its state of liberation, operates to dissolve the impurities in the material; the amount of chlorine gas and the hypochlorite solution being such that when the available chlorine gas, hypochlorous acid in its state of liberation, is exhausted, the cellulose material will have an orange color.

Pulp Stock Agitating Apparatus

Patent No. 2,164,944. John A. Rosmait, Manistee, Mich. Application June 10, 1936, Serial No. 84,593. 3 Claims. (Cl. 92—37). A storage chest for pulp stock having a floor sloping toward a depressed sump portion, a pump having an intake extending vertically down into the chest and into the depressed sump portion thereof terminating above the floor of the sump portion to withdraw pulp stock therefrom, a dome-shaped baffle encircling the pump intake adjacent to its lower end, said baffle extending outwardly and downwardly from the pump intake surmounting the depressed floor portion of the chest and spaced thereabove, and extending outwardly over the floor of the chest beyond said sump, said pump having oppositely directed discharge outlets adapted to deliver pulp stock into the chest adjacent to spaced apart portions of its side walls, each of said outlets flaring from a portion of reduced diameter at its intake end toward a portion of maximum diameter at its outlet end and means for delivering additional pulp stock into said outlets to mix with the pulp stock flowing therethrough from said pump, said pump intake terminating within the sump in a flaring end portion spaced from the sump wall and below the chest floor to cause the pulp stock to bend sharply as it flows through the sump into said pump intake.

Process of Producing Cellulosic Pulp

Patent No. 2,195,378. Thomas L. Dunbar, Watertown, N. Y., assignor to Chemipulp Process, Inc., Watertown, N. Y., a corporation of New York. Application November 22, 1935, Serial No. 51,162. Renewed August 22, 1939. 20 Claims. (Cl. 92—7). A process of producing chemical pulp which comprises charging a mass of woody material to a digester; accumulating a large volume of hot alkaline liquor in a pressure vessel; forcing the liquor from such vessel to the digester and evenly distributing the liquor over the material in the digester; recirculating the liquor directly to and from the digester while adding heat units thereto, and maintaining such circulation until the material has been digested, withdrawing hot liquor from the digester and utilizing such liquor to preheat the liquor in the pressure vessel.

Fermentation Process for the Preparation of Paper Pulp from Bagasse and Similarly Incrusted Cellulose Fibers

Patent No. 2,193,493. Ernest Augustus Ritter, London, England, assignor to Universal Cellulose (Proprietary) Limited, Durban, Natal, Union of South Africa, a company of the Union of South Africa. Application June 2, 1938, Serial No. 211,410. In Great Britain June 30, 1937. 14 Claims. (Cl. 195—10). A process for the preparation of paper-pulp from bagasse and similarly incrusted cellulosic materials which consists in impregnating said material with a liquor containing a bacteria culture derived from the natural bacteria of the said bagasse and containing up to about 5% of nutrient for the bacteria, circulating said material through launders by an excess of said liquor and discharging the mass onto a sterilized floor to closely pack the bagasse thereon, draining the excess liquor from the impregnated mass, allowing the impregnated bagasse to ferment until the greater part of the non-cellulosic material is removed, washing, compressing and baling the treated bagasse, carrying out a further treatment by dipping the bales into a solution of a disincrusting agent of the class consisting of diluted soda, sulphate, sulphite and monosulphite solutions and allowing the bales to dry in an open stack to a moisture content of between about 12 and 20%.

Single Ply Asbestos Faced Drier Felt

Patent No. 2,168,928. William A. Barrell, North Andover, Mass., assignor to Lawrence Duck Company, Lawrence, Mass., a corporation of Massachusetts. Application July 13, 1937, Serial No. 153,309. 10 Claims. (Cl. 139—383). A drier felt of single ply construction consisting of interwoven substantially asbestos warp and weft strands, of which the warp strands are distributed substantially uniformly across the width of the felt and each warp strand passes over a group of successive weft strands in the face and under a single weft strand in the back of the felt, in repeated series, and the loops of adjacent asbestos warp strands passing to the back of the felt embrace respectively different weft strands, and warp strands of other material and greater strength than the asbestos strands interspersed between the asbestos warp strands and all passing in parallel sinuous courses alternately over the same weft strands which are embraced by said loops and under the intermediate weft strands, with sufficient crimp to prevent displacement of the weft strands lengthwise of the warp.

Bleaching Pulp

Patent No. 2,194,956. Maurice C. Taylor, Niagara Falls, and George P. Vincent, New York, N. Y., assignors to The Mathieson Alkali Works, Inc., New York, N. Y., a corporation of Virginia. Application January 10, 1939, Serial No. 250,168. 13 Claims. (Cl. 8—105). In the bleaching of cellulosic materials with chlorites, the improvement which comprises forming an aqueous pulp of the cellulosic material containing the chlorite at a pulp density in excess of about 15% under conditions such that the chlorite is substantially inactive and thereafter activating the chlorite.

Treatment of Paper and Board

Patent No. 2,193,695. Sidney Musher, New York, N. Y., assignor to Musher Foundation Incorporated, New York, N. Y., a corporation of New York. Application March 29, 1939, Serial No. 264,735. 9 Claims. (Cl. 92—21). The method of making antioxygenic paper and board which comprises incorporating with the paper and board about between 0.2% and 5% of cacao residue, and then heating to at least about 220° F.

Antioxygenic paper and board containing between about 0.2% and 5% of cacao residue and having a pH of between about 4 and 6.9.

THE DRAPER FELT

Unexcelled for strength, openness, resiliency, and general running qualities. Made to meet the most exacting conditions on all types of machines and all kinds of papers. Only one grade and that the highest.

Made by

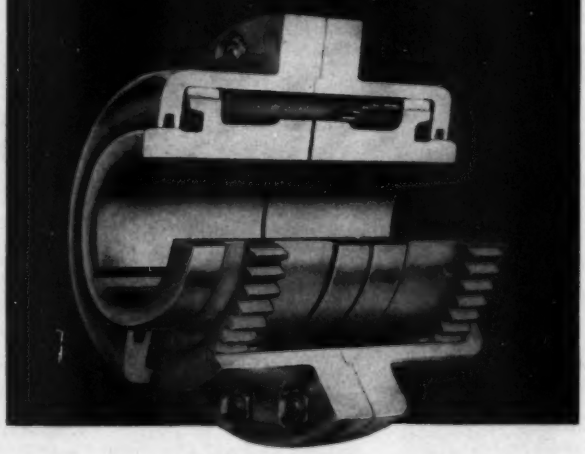
DRAPER BROTHERS COMPANY
CANTON, MASS.

Woolen Manufacturers Since 1856

REPRESENTATIVES

L. H. BREYFOGLE, Kalamazoo, Mich.
W. L. CAMPBELL, Savannah, Ga.
C. K. BEECHER, Delaware, Ohio
O. J. LELOFF, Vancouver, Wash.

POOLE



A COPY OF CATALOG GIVING FULL DESCRIPTION AND ENGINEERING DATA SENT UPON REQUEST.

FLEXIBLE COUPLINGS

POOLE FOUNDRY & MACHINE COMPANY — WOODBERRY, BALTIMORE, MD.

GEORGE F. HARDY
Consulting Engineer
305-309 Broadway, New York City, N. Y.

Member—Am. Soc. C. E.—Am. Soc. M. E.—Eng. Inst. Can.
Consultation—Reports—Valuations—Estimates—Paper and Pulp Mills—Hydro-Electric and Steam Power Plants—Plans and Specifications

FOR SALE: *Used Vacuum Pumps.* Three Type L-9 Nash Hytor Vacuum Pumps. Also three 100 HP, 865 r.p.m., 2300 Volt, Squirrel Cage Induction motors with Starting equipment, Texrope drive. All very good condition. Pump Performance Curves available. Address Bert T. Yeager, Commissioner, Sioux Falls, South Dakota.

WANTED—Salesmen or Manufacturers' Agents now calling on industrial trade, preferably with mechanical power transmission items, to handle our revolutionary Nonslip Pulley Covering. Easily applied, best performance records. Very liberal commission. Write fully, giving references and lines now handled. Nonslip Pulley Covering Co., 777 Hertel Avenue, Buffalo, New York.

GUARANTEED EQUIPMENT AT 50% SAVINGS

VARI-SPEED VARI-VOLTAGE PAPER MILL DRIVE consisting of 150 HP Variable Speed 230 volt DC motor, 200 KW Motor-Generator Set, complete with control equipment. **Send us your inquiries—for real savings**

CHICAGO ELECTRIC CO.
1324 W. 22nd St., Chicago, Ill.

New Catalogues and Publications

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—A splendidly-illustrated, comprehensive publication covering this company's sales and engineering developments has been issued recently. The 90-page, metal-bound publication is divided into nine sections, each of which illustrate the new developments of as many departments of the company; i.e., blower and compressor department, crushing, cement and mining department, electrical department, engine and condenser department, feedwater treating department, hydraulic department, milling department, steam turbine department and tractor department. This review contains numerous photographs, in addition to drawings, and should be in every industrial library.

Crane Co., Chicago—The complete line of "tailor-made" small steel valves produced by this company are described fully in a new bulletin recently published by this company. Photographs and drawings aid the well-written material in bringing to the reader a clear idea of the construction and uses of these valves. Specification data are given as are list prices.

Fairbanks, Morse and Co., Chicago—A new bulletin (No. 5972) has to do with this company's two-stage centrifugal pumps with capacities up to 550 g.p.m. at heads ranging up to 600 feet. The illustrated bulletin describes the general application of these pumps and contains specification data. A large cross-sectional drawing of the unit is included.

General Dyestuff Corp., New York City—Two circulars describing two new dyestuffs produced by this company have been issued. The circulars stress features of the company's Victoria Blue Rap and Katigen Paper Black RP Consc, both of which have a place in the paper industry.

General Refractories Co., Philadelphia—Comprehensive data on Sillimanite refractories—brick, cement and plastic—are given in a new bulletin (No. 209) just put out by this company. Various properties of the refractories are explained and features pointed out in this new release. Data as to the uses of the refractories are included as are recommendations.

Glyco Products Co., Inc., New York, N. Y.—The latest edition of "Chemicals by Glyco" is now ready for distribution. The 96-page catalogue describes the glycol and glyceryl esters, emulsifying agents, special emulsions, synthetic waxes, synthetic resins, and a number of specialties of wide interest and application. One section of this publication is devoted to suggested formulae and other information for the manufacturers of numerous types of products. Much information regarding chemicals used in the paper industry is contained in this catalogue.

Industrial Gloves Corp., Danville, Ill.—A new catalogue of this company's safety clothing has just been issued by this organization. The well-illustrated publication features various safeguards such as mitts, finger-guards, leggings, spats, aprons, etc. The publication stresses the necessity for choosing correct safety garments.

Ingersoll-Rand Co., Phillipsburg, N. J.—This company's Type R surface condensers are fully described in a new publication (Form 2622) recently issued. Cross-sectional drawings, together with photographs and installation views, give the reader a clear concept of the product's function and use.

Leeds and Northrup Co., Philadelphia—A new bulletin (No. N-33) has to do with this company's line of industrial instruments is fashioned after the convenient roadmap type of folder. Spread out on a desk, this bulletin shows at a glance the choice of equipments available for a given job—the important features embodied in each and the specific publications to which anyone interested can turn for more detailed information. There is also a concise discussion of the thermocouples, Rayotubes, Thermohms and optical-type temperature detectors available.

Lewis-Shepard Sales Corp., Watertown, Mass.—In commemoration of its twenty-fifth anniversary this company has recently published a very informative Silver Anniversary Edition of its Engineering Catalogue (No. 21) covering over 175 of the most important items in the Lewis-Shepard line of materials handling equipment. The 8½x11 release is printed in two colors and contains about 300 illustrations, diagrams, and photographs of individual machines, important operating and structural features and equipment in action. A complete index of the company's equipment is published on the inside front cover.

Magnus Chemical Co., Garwood, N. J.—A series of detailed performance reports from paper mills, outlining improvements and economies effected by the use of properly-selected slime-removing compounds, felt cleaners, wetting agents, etc., has been compiled by this company. The reports, bound loose-leaf in an attractive blue and orange folder, are classified according to the nature of paper mill operations concerned such as felt cleaning, under which is writing paper, roofing paper, box board, facial tissue, book paper and tissue stocks, photographic stock, box board, bond paper, bristol board, drawing and special stocks. Other mill operations included are cleaning fourdrinier screen plates, slime control and removal, beater operation, etc.

Reeves Pulley Co., Columbus, Ind.—A new folder put out by this company explains the service offered by this company's speed control engineers in addition to illustrating installations of Reeves pulleys and transmissions. There is much of interest in this folder.

Revere Copper and Brass, Inc., New York City—Practical and complete tables of weights and data on copper, brass and bronze products are incorporated in a very valuable handbook recently published by this company. The handbook represents a distinct advance in this type of reference work inasmuch as every weight has been recalculated and expressed in three significant figures. In addition to direct weights on standard alloys, conversion factors provide ready means for determining the weights of other or special alloys in any standard form. The book is especially designed for engineers, draftsmen, estimators and designers who may procure this book from the company.

Joseph T. Ryerson & Son, Inc., Chicago—The 1940 stock list recently published by this company is the largest and most complete steel buyer's guide ever put out by Ryerson. A number of mechanical improvements have been made to the 256-page list, including an enlarged complete main index, handy thumb tab margin indexes, eye-conditioned paper, and a new type of mechanical binding that assures flat, easy-turning paper. The book is published in ten editions, each giving a complete description of the wide range of Certified Steel products carried in stock by one of the Ryerson plants. It is requested that interested parties use their business letterheads when requesting copies of this book.

BOOKS

Wage and Hour Manual—This manual, dealing with Federal and State wage and hour laws, is divided into three parts. Part I provides a complete and understandable review of the application and enforcement of the Fair Labor Standards Act. Its contents are organized as a guide-book for solving day-to-day problems that arise under this statute. Part II is a guide to regulations regarding wages and hours that must be observed by those bidding on contracts with the Federal Government. Besides giving the text of the Public Contracts Act and of the rules and regulations issued under it, this portion of the book sets forth the official rules of practice under the law and gives all wage determinations made up to the end of 1939. Part III does for State wage and hour laws what Part I does for Fair Labor Standards Acts. State statutes authorizing or imposing regulations of wages and hours on intra-state industries, together with the wage orders which have been issued under such laws, are covered. A complete topical index makes instantly available every item of information in this comprehensive guide to the solution of the wage and hour problem. The book is published by the Bureau of National Affairs, Inc., 2201 M. Street, N. W., Washington, D. C. Price is $5.

Statistical Abstract of the United States (1939)—The Bureau of the Census, U. S. Department of Commerce, Washington, D. C., has announced the 61st annual edition of *Statistical Abstract of the United States*, a volume of more than 900 pages of statistical data relating to the social and economic condition of the population and to the industrial, commercial, and governmental activities of the nation. So numerous are the data that the material is arranged conveniently into 34 sections for ease in making reference to it. A few of the typical sections are the following: area and population; education; wages, hours of labor, and employment; power; foreign commerce of the United States; forest and forest products; mining and mineral products, and manufactures. The book, bound in buckram, is priced at $1.50 a copy. Copies may be purchased from the Superintendent of Documents, Washington, D. C.

The Foreman's Daily Prompter—This little book, by J. J. Phillips, has been written for foremen of industrial plants as an aid to them in the handling of problems involving human relationships. It is pocket size, contains only about 50 pages, and is bound attractively in a red cloth cover, with title printing in gold. Priced at $1.00 a copy, the little volume is literally filled with a variety of worth-while hints and suggestions. The publisher of this little volume is The Christopher Publishing House, 1140 Columbus Avenue, Boston, Massachusetts.

Commodities in Industry, The 1940 Commodity Yearbook—The highlight of this book is a description of methods used in the production of seventy-five basic raw materials. The seventy-five commodities, from alcohol to and including zinc, are covered individually, one chapter for each material, in an alphabetical arrangement. These studies, paper being one of them, are supported by more than 150 charts and 625 statistical tables. In addition, there are feature studies which treat of war and commodities, trends in per capita consumption, synthetics and plastics, and weather forecasting. The volume has a page size of 8½x11 in., totals over 700 pages of material, and is bound most attractively in a blue cloth cover upon which title printing is in gold. Published by Commodity Research Bureau, Inc., 82 Beaver Street, New York, New York. The book is priced at $7.50 a copy.

GLENS FALLS
MACHINE WORKS, Inc.
GLENS FALLS, N. Y.

• • •

Manufacturers of

Improved Rogers and Special Wet Machines

•

Standard Wet Machines

•

Glens Falls Rolling Action Flat Screen

•

The A. D. Wood Saveall, Thickener, Washer and Water Screen

•

Glens Falls Decker and Decker Washer

•

Glens Falls Rotary Sulphur Burner

•

Pulp Grinders, Three or Four Pocket

• • •

Write for descriptive literature

KALAMAZOO ★

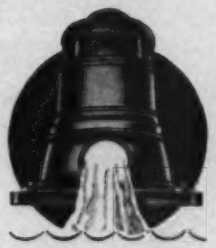
Glazed Tile TANKS

As permanent as reinforced concrete—and cost less. First tanks built show no deterioration today and are as clean as when first erected.

Manufacturers of wood tanks for 60 years.

KALAMAZOO TANK & SILO CO.
KALAMAZOO MICHIGAN

Figure the Cost
OVER MANY LONG YEARS



First, a Layne Well Water System will greatly increase your water supply. Second, the low operation will usually drastically reduce your water service expense. And, third, the annual saving in operation cost will retire the entire installation cost within a few years.

The use of finest quality materials, rugged construction throughout, and advanced engineering features mean many long years of service. Many Layne Wells and Pumps are still in regular use after a quarter century of service. No other well water developing organization can point to such records of efficiency.

AFFILIATED COMPANIES

LAYNE-ARKANSAS CO., STUTTGART, ARK.
LAYNE-ATLANTIC CO., NORFOLK, VA.
LAYNE-CENTRAL CO., MEMPHIS, TENN.
LAYNE-NORTHERN CO., MISHAWAKA, IND.
LAYNE-LOUISIANA CO. LAKE CHARLES, LA.
LAYNE-NEW YORK CO., NEW YORK CITY, AND PITTSBURGH, PA.
LAYNE-NORTHWEST CO. MILWAUKEE, WIS.
LAYNE-OHIO CO., COLUMBUS, OHIO
LAYNE-TEXAS CO., HOUSTON AND DALLAS, TEXAS.
LAYNE-WESTERN CO., KANSAS CITY, MO. CHICAGO, ILL., OMAHA, NEBRASKA
LAYNE-WESTERN CO. OF MINNESOTA MINNEAPOLIS, MINN.
LAYNE-BOWLER NEW ENGLAND COMPANY, BOSTON, MASSACHUSETTS.
INTERNATIONAL WATER SUPPLY, LTD., LONDON, ONTARIO, CANADA

Any City, Factory, Paper Mill, Oil Industry, Railroad, Irrigation, or business official may secure a complete file of bulletins, catalogs and folders on Layne Well Water Systems without obligation. Address

LAYNE & BOWLER, INC.
Dept. P, Memphis, Tenn.

LAYNE

PUMPS & WELL WATER SYSTEMS

For Municipalities, Industries, Railroads, Mines and Irrigation

CURRENT MARKET QUOTATIONS

RAGS (Domestic)
f. o. b. New York City

NEW RAGS — per cwt.

Blue Overalls	4.75 to 5.00
Corduroy	2.50 to 2.75
Cottons—	
Washables, No. 1	2.00 to 2.25
Fancy Percales	4.00 to 4.25
New Soft Blacks	3.50 to 3.75
New Light Seconds	1.75 to 2.00
New Dark Seconds	1.60 to 1.75
Khaki Cuttings—	
Mixed	2.75 to 3.00
O. D.	3.25 to 3.50
New Canvas	7.75 to 8.25
New Mixed Blacks	2.50 to 2.75
Shirt Cuttings—	
New White No. 1	7.25 to 7.50
Silesias No. 1	4.50 to 4.75
New Unbleached	7.00 to 7.25
Fancy	2.25 to 2.50

RAGS (Domestic)
f. o. b. New York City

OLD RAGS

Roofing—	per cwt.
No. 1	.90 to .95
No. 2	.80 to .85
No. 3	.70 to .75
Twos and Blues—	
Repacked	1.65 to 1.80
Thirds and Blues—	
Repacked	1.40 to 1.50
Miscellaneous	1.10 to 1.20
White, No. 1—	
Repacked	3.00 to 3.25
Miscellaneous	2.75 to 3.00
White, No. 2—	
Repacked	2.50 to 2.75
Miscellaneous	2.00 to 2.25

RAGS (Foreign)
ex dock New York City

NEW RAGS — per cwt. — Nominal

New Dark Cuttings
New Mixed Cuttings
New Light Silesias
Light Flannelettes
Unbleached Cuttings
New White Cuttings
New Light Oxfords
New Light Prints

RAGS (Foreign)
ex dock New York City

OLD RAGS — per cwt. — Nominal

No. 1 White Linens
No. 2 White Linens
No. 3 White Linens
No. 4 White Linens
No. 1 White Cottons
No. 2 White Cottons
No. 3 White Cottons
No. 4 White Cottons
Extra Light Prints
Ord. Light Prints
Med. Light Prints
Dutch Blue Cottons
French Blue Cottons
French Blue Linens
Cheeks and Blues
Linsey Garments
Dark Cottons
Old Shopperies

ROPE and BAGGING
f. o. b. and ex dock New York City

Gunny No. 1—	per cwt.
Foreign	2.40 to 2.50
Domestic	2.40 to 2.50
Wool Tares—	
Light	2.25 to 2.35
Heavy	2.40 to 2.50
No. 1 Scrap Bagging	2.15 to 2.25
Manila Rope—	
Foreign	4.25 to 4.50
Domestic	4.25 to 4.50
New Burlap Cuttings	3.25 to 3.50
Jute Threads—	
Foreign	3.25 to 3.50
Domestic	3.00 to 3.25
Strings—	
Sisal	2.25 to 2.50
Soft jute	3.25 to 3.50
Mixed	1.10 to 1.25

WASTE PAPER
f. o. b. New York City

Shavings—	per cwt.
White Envp. Cuttings	3.50 to 3.75
Ord. Hard White No. 1	2.75 to 3.00
Ord. Soft White No. 1	2.40 to 2.60
Soft White, Extra	3.00 to 3.25
Flat Stock—	
Stitchless	1.00 to 1.20
Overissue Mags	.90 to 1.10
Solid Flat Book	.80 to 1.00
Crumpled No. 1	.70 to .80
Solid Ledger Books	2.00 to 2.15
Ledger Stock—	
White	1.90 to 2.00
Colored	1.40 to 1.50
New B. B. Chips	.45 to .50
Manilas—	
New Env. Cuts	2.35 to 2.50
New Cuttings	1.90 to 2.00
Sulphite Mill Wrappers	.50 to .55
No. 1 Old Kraft	1.65 to 1.75
News—	
No. 1 Wh. News Cuttings	1.75 to 1.90
Strictly Overissue	.70 to .80
Strictly Folded	.55 to .65
No. 1 Mixed Paper	.40 to .50

CHEMICALS
f. o. b. shipping point

Alum (Papermakers)—	
Lump, cwt.	3.75 –
Ground, cwt.	3.50 –
Powdered, cwt.	3.90 –
Blanc Fixe—	
Pulp, bulk, ton	35.00 to 40.00
Dry, barrels, pound	.0300 to .0400
Bleaching Powder—	
Drums, cwt.	2.00 to 3.00
Casein (Domestic Standard)—	
30-30 mesh (bags), lb.	13.50 to 14.50
80-100 mesh (bags), lb.	14.50 to 15.00
Argentine, lb.	12.50 –
China Clay—	
Domestic Filler Bulk (mine) ton	7.50 to 15.00
Domestic Coating Bulk (mine) ton	11.00 to 22.00
Imported (ship side) Bulk (lump) ton	13.00 to 25.00
Chlorine—	
Tank cars (wks) cwt.	1.75 to 1.90
Gelatine (silicin), lb.	.53 to .55
Glye. (C.P.) drums, lb.	.1250 to .1300
Litharge, powd., bbl., lb.	.0775 to .0800
Rosin (Gum)—	
New York, 280 lb. barrel	
E, per bbl.	5.60
F, per bbl.	5.90
G, per bbl.	5.90
WW, per bbl.	7.30
Rosin (Wood), per bbl., carlots	4.00 –
Salt Cake—	
Dom. bulk (wks) ton	16.00 to 17.00
Imp. bulk on dock—(Atl. ports) ton	20.00 to
Soda Ash—	
Bulk (works) cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.35
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—Ammonia,	
Solid, drums, cwt.	2.30 –
Ground and flake, drums, cwt.	2.75 –
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.65 to 2.00
40 deg., 55 gal. drums, (works) cwt.	.80 to 1.20
Starch—	
Pearl, 140 lb. bags, cwt.	2.70 –
Pearl, barrels, cwt.	2.80 –
Paper (Sp.) bags, cwt.	2.80 –
barrels, cwt.	2.90 –
Sulphur (crude)—	
(mine) bulk, long ton	16.00 to 20.50
Talc—	
Dom. 100 lb. bags (mine) ton	14.00 to 17.25
Imp. bulk, ton	23.00 to –
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05¼ to .05½
Calcium Pig., bbls., lb.	.05 to .05¼
Zinc Sulphide, bbls., lb.	.07½ to .07¾

CHEMICAL PULP
(Air-dry ton)

Soda (Dom.) del'd. mill—	per ton
Bleached, contract	2.90 –
Open market	3.15 –
Sulphate (Dom.) f. o. b. mill—	
Bleached	3.50 to 4.00
Kraft No. 1	3.00 to 3.25
Kraft, Southern, del.	3.00 to 3.25
Sulphate (Imp.) on dock—	
Bleached	4.25 to 4.50
Kraft No. 1	3.50 to 3.75
Kraft No. 2	3.25 to 3.50
Sulphite (For.) On dock—	
Prime bleached	4.00 to 4.25
Prime easy bleach	3.75 to 4.00
Prime strong unbl.	3.50 to 3.75
Sulphite (Dom.)	
Bleached, contract	3.07½ to
Bleached, open market	3.50 –
Unbleached, contract	2.62½ to
Unbleached, open market	3.00 –

MECHANICAL PULP
(Air-dry ton)

No. 1 Dom. & Can. (f. o. b. pulp mill)	per ton 32.00 to 35.00
No. 1 Imp. (On dock)—	
Moist	(nominal) 40.00 to 42.00
Dry	(nominal) 43.00 to 45.00

PAPER
f. o. b. New York City

Boards—	per ton
Binders	75.00 to 80.00
Chip	40.00 to 45.00
Chip, sgl. mla. lined	55.00 to 60.00
Coated, white patent .016	77.50 –
.020 and heavier	72.50 –
Kraft liner	55.00 –
News	40.00 to 45.00
Book (eased)	**per cwt.**
No. 1 Glossy Coat	11.90 to 13.50
No. 2 Glossy Coat	10.35 to 11.75
No. 3 Glossy Coat	9.55 to 11.00
No. 4 Glossy Coat	9.15 to 10.50
No. 2 Offset	7.70 to 9.00
A Grade M. F.	6.40 to 7.15
A Grade Super	6.65 to 7.40
B Grade M. F.	5.95 to 6.70
B Grade Super	6.20 to 6.95
B S. & S. C. Litho	6.45 to 7.20
B M. F. Litho	6.20 to 6.95
Ivory & India	.50 cwt. extra
Bonds (Rag Content)—	
100% Rag	per cwt.
Ext. No. 1	39.10 to 46.00
100% Rag	31.05 to 36.50
85% Rag	
75% Rag	23.60 to 27.75
65% Rag	20.50 to 25.00
50% Rag	17.55 to 21.50
25% Rag	14.65 to 17.75
Regular Colors	1.00 cwt. extra
Bonds (Sulphite)—	**per cwt.**
No. 1	8.95 to 11.00
No. 2	8.05 to 9.75
No. 3	7.60 to 9.25
No. 4	7.30 to 9.00
Colors	1.00 cwt. extra
Glassine (f. o. b. mill)—	**per cwt.**
Embossed (25 lb. up)	13.25 –
Bleached (25 lb. up)	12.25 –
Unbleach. (25 lb. up)	11.00 –
Greaseproof—	
Bleach. (25 lb. up)	10.00 –
Unbleach. (25 lb. up)	9.00 –
Ledgers (Rag Content)—	
100% Rag	per cwt.
Ext. No. 1	40.25 to 47.25
100% Rag	32.20 to 37.75
85% Rag	29.90 to 35.00
75% Rag	24.75 to 29.00
65% Rag	21.65 to 26.25
50% Rag	18.70 to 22.75
25% Rag	15.80 to 19.25
Regular Colors	1.00 cwt. extra
Ledgers (Sulphite)—	**per cwt.**
No. 1	10.10 to 12.25
No. 2	9.25 to 11.25
No. 3	8.50 to 10.75
No. 4	8.50 to 10.25
News—	**per ton**
Rolls (Contract)	49.00 to 50.00
Rolls (Spot)	(nominal)
Sheets	58.00 –
Tissues (Carlots)—	**per ream**
White, No. 1	.92½ –
White, No. 2	.65 –
Anti-Tarnish M. G.	.80 –
Colored	.87½ –
Kraft	.80 –
Manila	.65 –
Napkins, semi-crepe (12½ lb. to M shts.) per cs.	.41 –
Napkins, full crepe and emb'sed (12½ lb. to M shts.) per cs.	.43½ –
Toilet, Bleached (M shts.) per cs.	5.80 –
Toilet, Unbleached (M shts.) per cs.	3.50 –
Towels—	**per case**
Bleached	3.10 to 3.65
Unbleached	1.95 to 3.30
Wrappings (Kraft)—	**per cwt.**
Extra Quality	5.00 to 5.50
Super-Standard	4.75 to 5.00
Northern Standard	4.25 to 4.75
Southern Standard	4.25 to 4.75
Wrappings (Sulphite and Bleached Kraft)— (Rolls, f. o. b. mill)	
Bleached papers—	
M.F. & M.G. Waxing, 20 lb. (Carloads only)	per cwt. 6.25 –
(10,000 lbs.)	6.75 –
Drug wrapp. 35 lb.	6.25 –
Unbleached Papers—	
Com. Grd. Butch. 40 lb	4.62½–
No. 1 Butchers	5.00 –
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	5.25 –
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	5.00 –
Steam Finish, 50 lb.	4.00 –
Water Finish, 40 lb.	4.75 –
Manilas—	
Envp. Mla., Sub. 16-40 (No. 1)	5.00 –
Envp. Mla., Sub. 16-28 (No. 2)	4.75 –
Envp. Mla. (Prices based on large sheets untrim'd ream-marked, in bdls.)	
Wrapp. Mla. 35 lb. up—	
No. 1	5.25 –
No. 2	5.00 –
M. G. Sulphite and Kraft (other than Waxing)	
Grade A-25 lb.	6.00 –
Grade B-25 lb.	5.50 –